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LESSONS TO BE DRAWN FROM THE WAR IN INDOCHINA

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MEANING OF THE ABBREVIATIONS

B.O.S.M. = Battalion of the Personnel of the Material Service

C.O.M.L.E. = Company of the Personnel of the Material of the Foreign Legion

C.O.S.M. = Company of the Personnel of the Material Service

C.R.A.L.E. = Automotive Maintenance Company of the Foreign Legion

C.R.E.I. = Infantry Foreign Repair Company

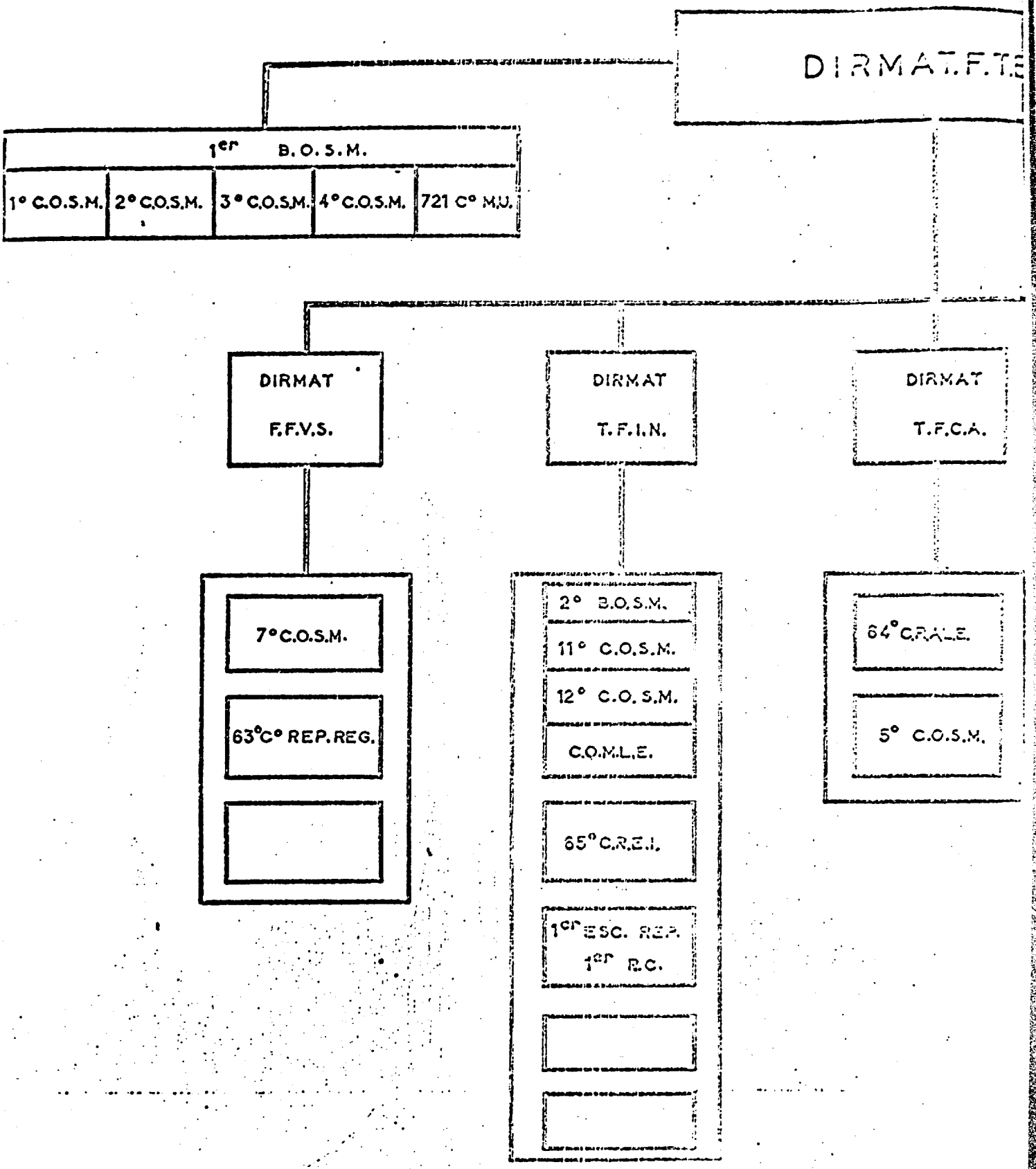
E.S.M. = Material Service Establishment

F.F.V.S. = French Forces of South Vietnam

T.F.C.A. = French Troops of Central Annam

T.F.I.N. = French Troops of North Indochina

T.F.S.A.P. = French Troops of South Annam and Plateaux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1° C.O.S.M.
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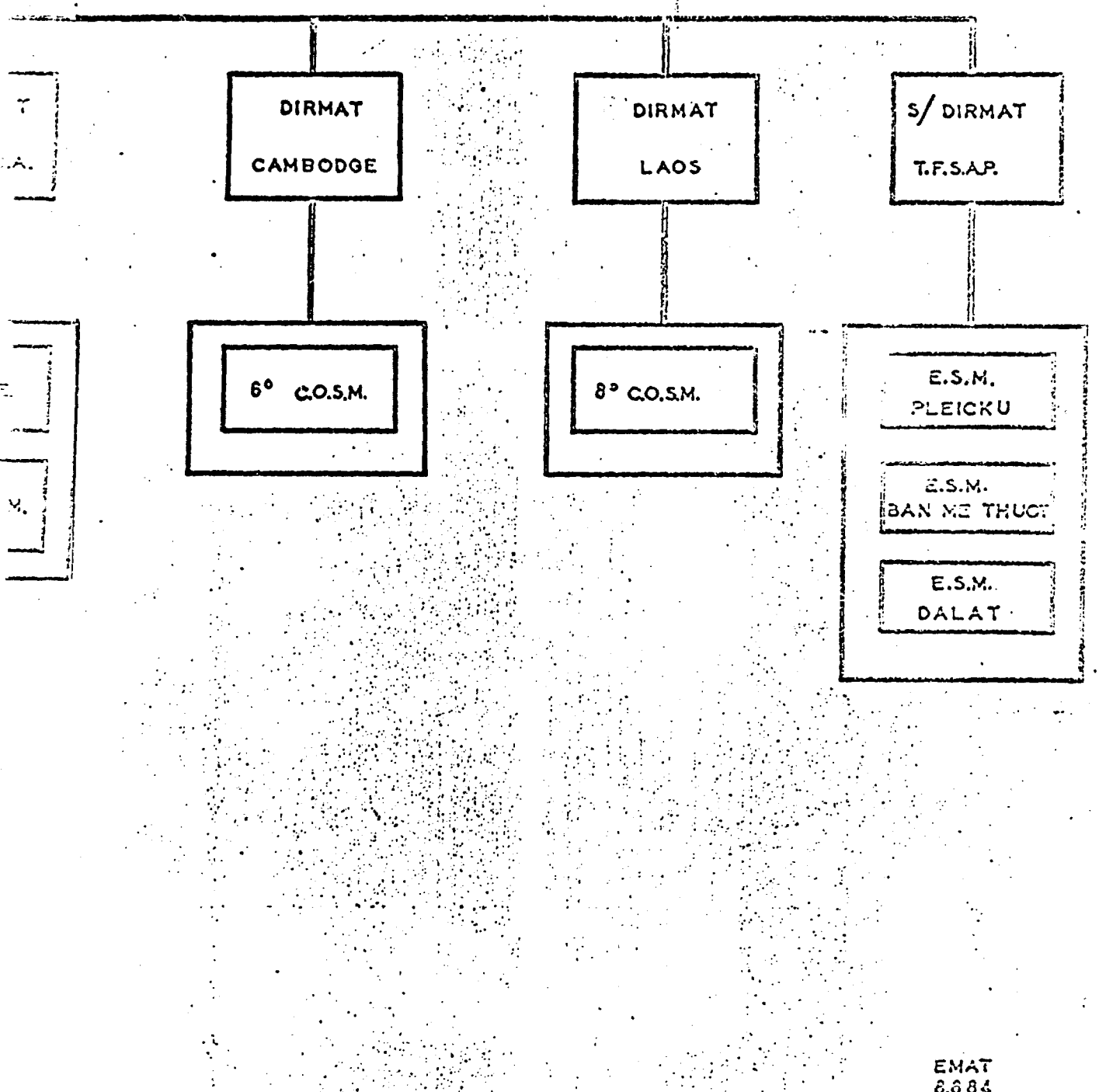
11° C.O.S.M.
12° C.O.S.M.
C.O.M.L.E.
65° C.R.E.I.
1er ESC. REP. 1er R.C.
64° C.R.A.L.E.
5° C.O.S.M.

1943

T.F.T.E.O.



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MEANING OF THE ABBREVIATIONS

B.O.T.K. = Base of Operations of Tonkin

B.R.G.M. = General Reserves Battalion of the Material

B.R.M. = Material Maintenance Battalion

C.C.M.R.M. = Colonial Company of Medium Material Maintenance

Cie. M. = Ammunition Company

Cie. Mag. = Storage Company

C.L.R.A. = Heavy Automotive Maintenance Company

C.L.R.M. = Heavy Material Maintenance Company

C.M.R.A. = Medium Automotive Maintenance Company

C.M.R.G. = General Reserves Ammunition Company

C.M.R.L.E. = Medium Maintenance Company of the Foreign Legion

C.M.R.M. = Medium Material Maintenance Company

C. Mu = Ammunition Company

C.R.E. = Total Maintenance Company

C.R.E.A. = Armored Vehicles Maintenance Company

C.R.E.A.L.E. = Armored Vehicles Maintenance Company of the Foreign Legion

C.R.E.F. = River Equipment Maintenance Company

E.R.G./MU = Depot of General Reserves Ammunitions

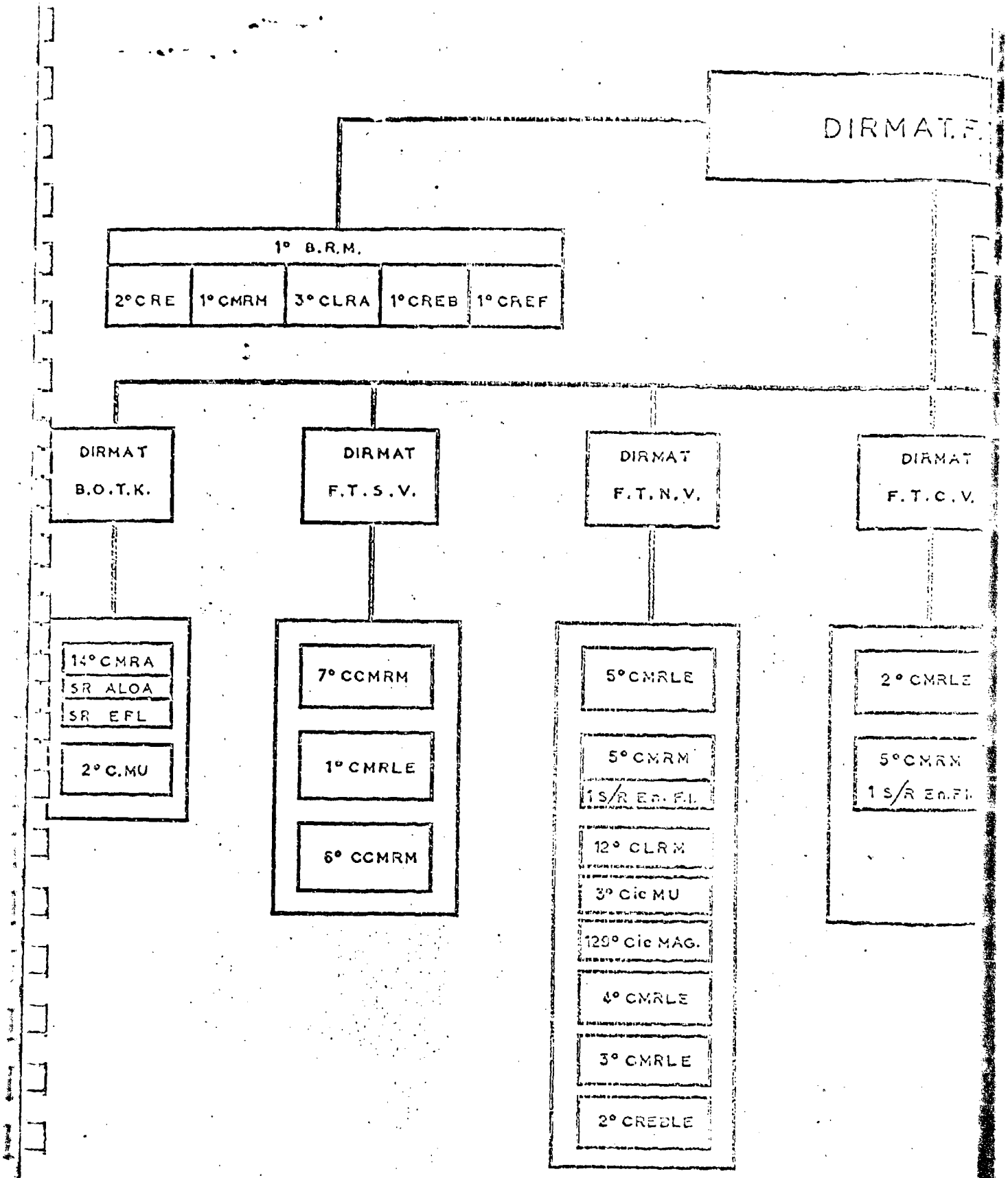
F.T.C.V. = Ground Forces of Central Vietnam

F.T.N.V. = Ground Forces of North Vietnam

F.T.S.V. = Ground Forces of South Vietnam

S.R./A.L.O.A. = Maintenance Section/ Light Aviation of Artillery Observation

S.R./E.F.L. = Maintenance Section/River Equipment


DIRMAT.F.
1° B.R.M.
2° C R E
1° CMRM
3° CLRA
1° CREB
1° CREF
DIRMAT B.O.T.K.
DIRMAT F.T.S.V.
DIRMAT F.T.N.V.
DIRMAT F.T.C.V.
14° CMRA
SR ALOA
SR EFL
2° C.MU
7° CCMRM
1° CMRLE
6° CCMRM
5° CMRLE
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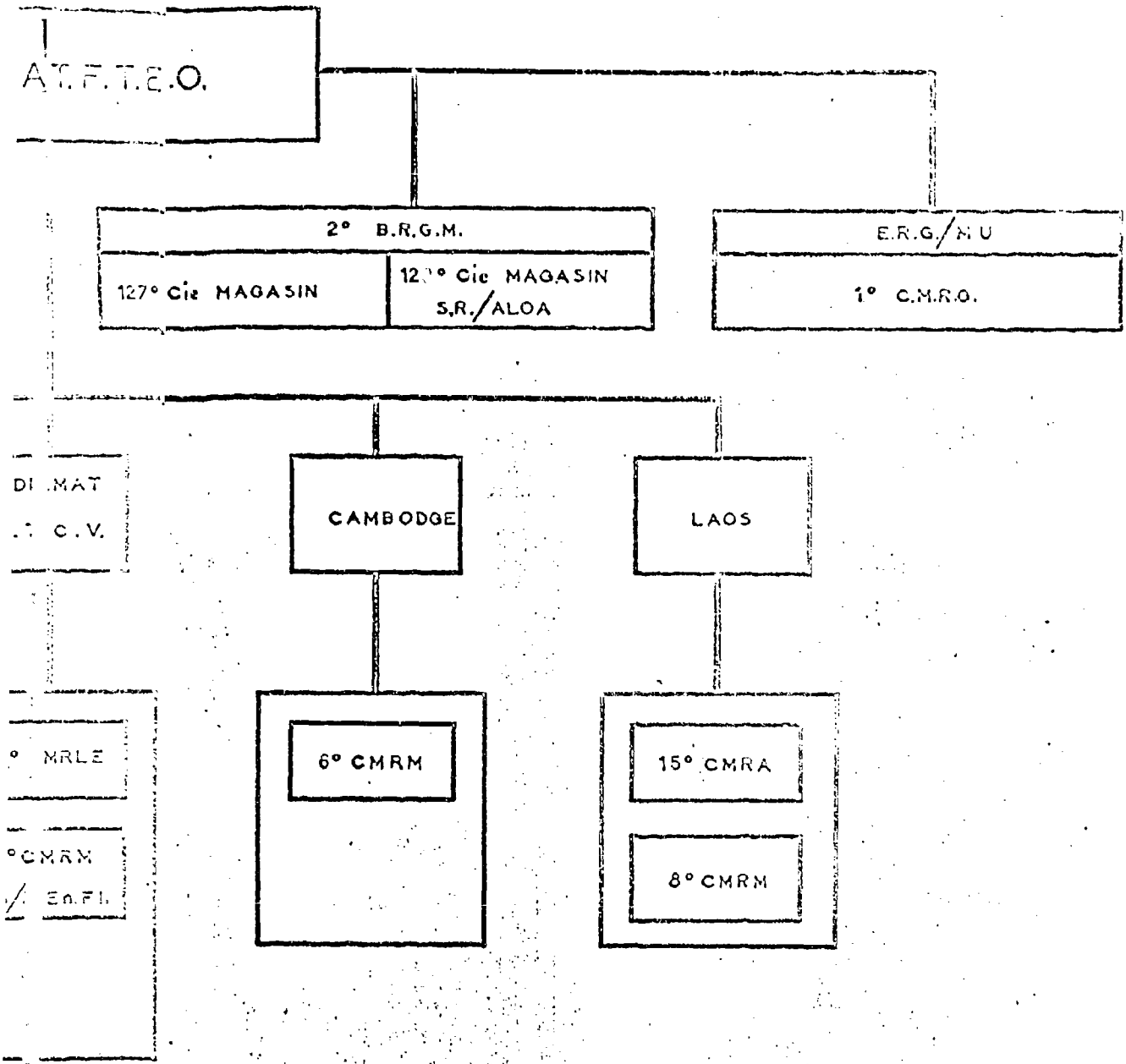
12° CLRM
3° Cie MU
129° Cie MAG.
4° CMRLE
3° CMRLE
2° CREBLE
2° CMRLE
5° CMRM
1 S/R En.Fl.

1953



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LESSONS TO BE DRAWN FROM THE WAR IN INDOCHINA

CHAPTER I. ORGANIZATION PROBLEMS

I. SUCCESSIVE CHANGES IN THE ORGANIZATION OF THE MATERIAL SERVICE FROM 1945 TO 1954

In order to be able to draw valid conclusions regarding the support lent by the Expeditionary Force during the campaign, it appear to be necessary to give a succint historical account of the Service.

The Material Service of the F.T.E.O. was created during the organization of the Staff of the Far East Expeditionary Force.

The Direction of the Material, installed at the beginning in Paris, 127, Avenue des Champs Elysees, was transferred to Saigon in December 1945.

Upon its arrival in Indochina, the Direction took possession of the previous Artillery Installations existing on the territory (Hanoi, Haiphong, Hue, Saigon, etc...).

Because of the rather large distances existing between the different parts of the Territory, Regional Directions and a group of Installations at Saigon forming the General Reserves were created immediately.

The effectives of the Installations were provided either by soldiers grouped in Companies or Battalions of the Material Service Personnel, or by the locally recruited civilian personnels.

The work was carried out under conditions resembling those of the work performed in France at a time where the 3rd and 4th echelon operations were frequently executed in the same installations. The creation of workshops having an industrial character and working according to technically efficient methods, will begin in Indochina toward 1949-1950 only.

No far-fetched alteration was effected in the operation of the Service between 1946 and 1948. The effectives remained small and the working methods more empirical than scientifically tested.

The Material Service of the F.T.E.O. was subjected by the personnel employed in Indochina to the influence of the different trends developping in France regarding the modernization of the Previous Artillery Installations. Thus the organization of a heavy workshop, specialized in the 4th echelon maintenance, according to modern methods was contemplated.

Already in 1949, a general reconstruction Installation, a Unit specialized in the repair of armored vehicles, and two "renovation chains" for G.M.C.'s and jeeps were created.

The intensification of the operations, the increase of the effectives used for these operations, the growing difficulties in the supplies, resulted in a concentration of the means utilized.

This concentration occurred gradually during 1950 and 1951, and the winding-up of the Material Installations of the type E.S.M., E.A.S.M., branch stores, was carried out during the first half-year of 1951. These were replaced by Units as they were created and used during the Campaigns of Italy and France (1944 - 1945).

The years of 1952 and 1953 were characterized by the most important performances on the part of the Material Service.

- Supplies of every kind, Major Items were poured into Indochina; at the same time the operations increased in intensity.

- The Material Service lent support to an important River Park, hence the need to create workshops and to proceed locally to the selection and training of the cadres and of the working force.

- The maintenance of the materials of Light Aviation of Artillery Observation (ALOA) was entrusted to the Material which received from France the cadres necessary for the formation of two repair sections, which were installed one in North Vietnam, the other in South Vietnam.

During this 1952-1953 period a very important effort was made for the benefit of the Armies of the Associated States. The reception of the materials necessary for the development of these Armies, the transfer of complete Units, increased substantially the already heavy charges of the Material Service.

Furthermore, since the operations increased in the Territory as a whole, it appeared to be necessary to secure the support of the Units as closely as possible to the Contending forces. All the Legion Units were developped into Mobile Sections provided with organic means and with supplies adapted to the missions performed. The results obtained by these Units were excellent.

Nevertheless the effectives of the Material proved to be insufficient

to satisfy the new requirements. Furthermore, since the operations seemed to assume a new character, it became a common occurrence to see several operational Groups operate in the same sector, of relatively small dimensions. Under these conditions, the Headquarters attributed supplementary effectives to the Material Service and ordered the formation of four divisional distribution Companies.

Only two of these Units were fully developped. The effective and allowance tables were nearly the same as those of the Units of the same type in France. Practically they did not have the time to be used. However, the preliminary experiments showed that such Units would have no doubt lent a rather limited assistance. Very much provided with heavy equipment and organized in order to work within the framework of the Company, these Units would have been unable normally to detach to the help of the combatting Units the light elements necessary for the support of the Formations during combats.

The "stop-fire" interference made it impossible to draw definitive conclusions in this regard.

Summing up, the development of the Material Service during the Indochina War depended on certain factors among which:

1. The necessity to use the disposition as it existed in 1945; hence later on the coexistence of two systems: the colonial formula of the 1939 installation type, and the France formula based on adapted mobile units

2. The modernization of the working methods which made it necessary to transform the Installations according to the successive changes occurring in the Service in France.

b. The necessity to adapt the Units to the ground and to the needs of the operations, hence

a. The formation of a river equipment Company of workshops, and of maintenance sections for the light aviation of Artillery Observation;

b. The formation of Units developped in mobile units and later on of divisional distribution companies.

This permanent effort of adaptation of the Service to the War conditions, based at the outset on the means then available, and using a personnel and resources which had to be constantly adjusted to the missions to be fulfilled, was one of the particular characters of the assistance provided to the combatant Units. As a result, units characterized by a certain difference according to the zones of operation considered, began to be put into operation.

Another interesting character of the organization of the Service, based on the economy of the means recurred to, was the reciprocal support convention adopted from 1953 in accordance with the National Forces, especially with the Vietnamese Forces. This reciprocal support made it possible to connect a combatant Unit with the nearest Material Unit whatever the nationality of the Unit.

Although this principle was useful for the National Forces more than for any others, it remains true that a certain number of Vietnamese Units, after sufficient training, lent very valuable assistance to the F.T.E.O. units operating in their vicinity (Operation Atlante).

B. ATTRIBUTIONS OF THE DIFFERENT ECHELONS

Already in 1945, the Material Service ensured the logistic support of the Ground Elements of the Expeditionary Force.

1. General Mission

Its mission consisted in the placing and maintenance of the material means of the F.T.E.O. involving the following categories:

- Special general use vehicles and armored machines
- River machines
- Individual and collective armament
- Ground, antiaircraft and antitank artillery
- Optics and topography
- Ammunitions and explosives
- Parachutes for personnel and material
- Equipment effects
- Harnesses
- A.L.O.A. material from 1953

Attributions

Its competence extended over

- the supplies
- the material transit
- the maintenance and management of the material
- the administration and management of the effectives belonging to the Service
- the technical verification of the use and repair of the material
- the technical studies)
- certain fabrications) since 1951

2. Organization

Two phases of the Organization will be considered in this study: December 1948 - December 1953.

The combined "organigrams" represent schematically the situation of the Material at these two dates.

The following Table represents the evolution of the Service Units between 1948 and 1954, at the "Cease-Fire" date.

EVOLUTION OF THE NUMBER OF COMMAND AGENCIES AND OF THE SERVICE UNITS FROM 1948 TO 1954 (Date of CEASE-FIRE)

	1948	1949	1950	1951	1952	1953	1954
Central Direction	1	1	1	1	1	1	1
Regional Directions	6	6	6	6	6	6	3
Installations	10	10	2	1	1	1	1
Units of the 3rd echelon	7	8	12	16	16	15	16
Units of the 4th echelon	-	3	3	4	4	4	5
Different Units	2	3	5	5	6	7	8

Let us examine this Organization as it existed in 1948 and as it had become in 1953 (1* See the two organigrams at the end of chapter I)

1. December 1948

The organization of the Material Service comprized:

a. a general Command Agency

The Director of the Material of the F.T.E.O. quartered at Saigon and possessing four specialized sections:

- Personnel
- Administration
- Armored Cars - River Park
- Armament - Ammunitions - Airborne Troops

The Technical Inspection, a control agency for the materials and the ammunitions, their use, repair, verification of arrivals, as well as the scrapping proposals.

Its special mission is to inform the Command of the general situation of the materials and ammunitions.

b. A General Reserve Execution Agency

The 1st Battalion of the Material Service Personnel comprizing five Companies quartered in fixed installations and distributed as follows:

- Three distribution Units taking care of the material, by more or less empirical and not scientifically tested methods
- A Unit taking care of the Transit and Storing of the supplies (4th C.O.S.M.)
- A unit taking care of the transit and storing of the ammunitions (721th Ammunitions Co)

c. Territorial Agencies

These agencies comprize command agencies represented by six territorial directions. Executing agencies in variable number are connected with these territorial directions, that is altogether:

- 17 Units of the 3rd echelon
- 2 different Units

Most of these units were quartered in the previous Artillery Installations existing on the Territory.

2. December 1953

From 1948 to 1953 the Material Service tried to improve its general organization.

Its articulation and organization resulted from its general mission. They adapted themselves closely, in a continuous and permanent way, to the articulation of the Combatant Forces in the different Sectors of the Theater of Operations. Thus the action of the Service was felt down to the combating elementary Unit echalon in operation.

This organization was subjected to the following alterations as compared with those studied previously:

a. General Command Agency

The Direction of the Material of the F.T.E.O. acquired the following Sections:

- an Organization Section
- a Central Supply and Purchase Service
- a Technical Section, a technical study agency, for the experimentation and study of the new materials.

b. General Reserve Execution Agencies

These have been completely altered during the years considered and, late in 1953, comprized agencies of a fixed character and articulated into three groups corresponding to three different missions:

- Transit and storing of Supplies (Material General Reserve Battalion) at Saigon

- Transit and Storing of Ammunitions (General Reserve Ammunitions Installation of Saigon and 2nd MU Co at the Tonkin Base of Operations)

- Distribution at the 4th and 5th echelons and reconstruction of materials (1st Battalion and Material Repair at Saigon, grouping five companies).

c. Execution Agencies

These comprized three Regional Directions commanding Units of the 3rd echelon in variable number according to the Territory, that is fourteen Units altogether.

Among these units six Maintenance Units were constituted on the basis of Legion personnels. There were articulated into Mobile Sections applied on the request of the Command to the different Operational Groups.

3. Special Cases of Assitance to the Associated States

The National Armies with rather restricted effectives until 1951 were logistically supported on the whole by the Material Service until 1952.

From 1952 these Armies organized a Material Service after the pattern of the Material Service of the F.T.E.O.

The F.T.E.O. cadres placed in the National Armies provided the framework of these Services which in fact gave efficient results only late in 1953 and after as a consequence of transfers of constituted Units coming from the Material of the F.T.E.O.

Furthermore the repairs at the 4th and 5th echelons, as well as the supply of every kind of materials of the Units of the Associated States were altogether secured until the "cease-fire" by the Material Service of the F.T.E.O.

CHAPTER II

AMOUNT DETERMINATION PROBLEMS. ROLE AND IMPORTANCE OF THE MATERIAL UNITS

We shall study these problems by considering successively:

- the support units
- the General reserve units.

First of all we shall examine the problems concerning the personnel which played an important part in the organization and efficiency of the different Units (Support, General Reserve).

A. PROBLEM OF THE PERSONNELS

The following Table gives some precise information concerning the evolution of the effectives of the Material Service from 1948 to 1954, at the date of the cease-fire. As a matter of indication we give the number of vehicles to be maintained, which permits an understanding of the parallel progression of the requirements of the Service/

Years	Military Effectives	Civilian Effectives	TOTAL	Number of Vehicles to be Maintained
1948	3.100	4.750	7.850	16.944
1949	4.283	4.750	9.033	20.000
1950	4.497	4.836	9.333	21.000
1951	5.536	5.938	11.474	24.670
1952	5.562	6.768	12.320	33.640
1953	6.242	5.357	11.599	37.370
1954	7.868	8.151	16.019	37.780

From 1951 to 1954 the percentage of the military effectives of the Material Service represented between 2.9% and 3.4% of the F.T.E.O. effectives of the Expeditionary Force.

This percentage, compared with the one accepted in the U.S. Army, which is of the order of 9 %, reflects clearly the difficulties encountered by the Material Service in the execution of its missions.

Under these conditions use was made as much as possible of locally recruited civilian labor.

The above percentages were more or less doubled by the contribution of the civilian labor, and thus varied between 6 and 7 % of the total effectives of the French Expeditionary Force.

Beside the fact that the U.S. percentage was never achieved, we must remark that this civilian recuitement offered working possibilities only in organized workshops and thus deprived the disposition of part of its mobility.

Finally, in addition to the above numerical difficulties, one must take into account the value of the recruited personnels; but of this, later on.

1. Military Personnels

a. The officer and noncommissioned officer cadres used in Indochina came from:

- the Material Service in France
- the Material Service and the Colonial Installations
- the Arms, to a small extent as regards the Artillery and the Colonial Infantry
- the Legion for the Units keeping the Legion collar-patch.

These officers, of very different origins, gave evidence, as a whole, of a high sense of duty in their profession. Although some of them, accustomed to the stable situation of the Installations, were somewhat surprised by the mobile situation of the direct support Units, nearly all of them adapted themselves rapidly to their new functions, and even some of them distinguished themselves during actions inwhich their Units had to take part.

As regards the noncomissioned officers and skilled noncommissioned officers, their number were always insufficient. Thus during 1954 when a special effort was made by France, the Material Service had actually at its disposal only:

- 40 % specialized noncommissioned officers among whom:
  - 16 % of the 4th echelon, and
  - 24 % with a lower Certificate.

The percentage of the Material Service in France at the same time was of the order of

- 78 % specialized noncommissioned officers representing
  - 43 % with a higher Certificate
  - 35 % with a lower Certificate

This situation was partly due to the fact that the noncommissioned officers listed in the basic table had a low seniority in rank and thus rarely possessed a higher Certificate.

b. Troops

The troop effectives were produced by enlisted or re-enlisted men.

Their technical value remained very variable according to the Arms of origin and to the races involved.

The Members of the Foreign Legion provided the most valuable elements of the Service. Among them are excellent specialists. Owing to successive re-enlistments, a valuable man power was formed.

France Material Service: The Material Service possessed only few enlisted men. Eigher the recruited men were very yound with little technical qualification, or were older re-enlisted men who came to Indochina because of their tasting for difficult situations or because of their incapicity to find a stable situation in France.

Such a man power provided few valuable elements, and the cadres, already limited in number, had to cope with the difficulty involved by the insufficient technical qualities of their troops.

Colonial Material Service: This Service happened to be more valuable than the Material Service in France because of its long-term re-enlisted men who were accustomed to the colonial life but were manifestly very insufficient in number.

North Africans and Vietnameses provided a very common man power, some drivers and some guarding personnel, or some General Service of the Units.

2. Civilian Personnels

Two types of personnel must be considered: the European effectives and the Vietnamese effectives.

a. European Effectives

These represented nearly 4 % of the recruited effective. Most of them were secretaries, office workers, typists or accountants. Their efficiency was evaluated as about 60 % of that of the French personnel of the same type.

b. Vietnamese effectives

These formed about 90 of the total recruited effective. Half of them approximately provided the usual man power from coolies to ordinary labor.

The other half provided a skilled man power of a very variable value according to the professions. Good electricians, painters, saddlers, woodworkers were found; sheet iron workers, welders, smiths and machine-tool specialists were of average skill.

Only a small nucleus of really skilled mechanics were available.

Whatever the situation might have been, the efficiency of these personnels barely exceeded 50 % of that provided by the French workers of identical specialties.

To sum up, this considerably diversity of personnel which existed even in the support and General Reserve Units conferred upon these a special character: On the one hand the different quantitative distributions of personnels brought into play made it possible to form support Units better adapted to the missions entrusted to them. On the other hand the formation of these Units caused sometimes serious difficulties of combination and control.

B. SUPPORT UNITS

Since the distribution and the supply of the materials of the armored cars absorbed 85 % of the activity of the Formations and Units, only the armored car problem will be studied within the framework of the support.

In the problem previously studied, mention is made of the insufficiency of effectives, and of the value of those put at the disposal of the Material Service. These difficulties had a definite incidence on the use of the 3rd echelon Units.

The maximum number of these Units was sixteen during the period considered as the most favorable regarding the effective in order to support an Automotive park of 37,800 vehicles. If it is admitted basically that one Unit under favorable conditions, can support about 1,200 vehicles, 31 units should have been used as a support of the Expeditionary Force.

The insufficiency of means explained above incited in certain cases the corps to present their materials to the maintenance Units when they had reached the limit of wear; which practically was reflected in

- the necessity to classify prematurely as 4th echelon a certain number of materials
- the congestion of the waiting Parks, the renovation chains finding difficulty to absorb the materials to be repaired
- a greater exchange of parts than normally in 4th echelon workshops.

Two solutions were adopted in order to remedy the difficulties encountered:

- an intermediate classification between echelons 3 and 4, the so-called "3rd long-term echelon"

- the authorization given to certain corps to carry out 3rd echelon operations.

3rd long-term echelon

The vehicles whose unavailability was evaluated as exceeding 30 days were classified as 3rd long-term echelon. These vehicles were lost by the original unit and replaced by maintenance vehicles on the same conditions as the vehicles classified as 4th echelon.

However, they were not sent to the 4th echelon Installations. The method had the following effects:

- It prevented the congestion of the waiting Parks (4th echelon)
- It limited the interterritory transports, always very expensive and difficult (road ruptures, the necessity to use the sea route from North Vietnam and from Central Vietnam, to reach Saigon where the 4th echelon units were quartered)
- It improved the generally poor regional maintenance by providing repaired vehicles to the maintenance Unit itself.

Authorization to Carry out 3rd echelon Operations in the Corps

A certain number of troops whose effectives were sufficiently important to support a supplementary load, were authorized, after selection, to carry out 3rd echelon operations. Provided with means and skilled personnel, they were able to operate already in 1951. They consisted mostly of armored vehicles or of groups of transportation of the Army Service Corps; their number up to 27 did not vary practically intil the cease-fire.

This contribution of support Units made it possible for the Material Service to carry out its mission under better conditions. Thus it was possible to articulate the Medium Maintenance Legion Companies into mobile sections (3 mobile sections) and a fixed section forming also a supply center, capable of lending their necessary assistance as close as possible to the combatants. This type of support, an effective and abundant solution, was made possible only because of the appreciable reduction of the lack of balance between the responsibilities supported by the Service and the means at its disposal.

C. GENERAL RESERVE UNITS

The general reserve units assumed the following parts:

I. Supply of materials other than ammunitions (ERG/MAT)

II. Ammunitions supply (ERG/MU)

III. Distribution of Material (4th and 5th echelon) 1st B.R. M)

I. SUPPLY OF MATERIALS OTHER THAN AMMUNITIONS
GENERAL RESERVE INSTALLATIONS OF THE MATERIAL

- reception
- storage
- distribution to the Territories

of every kind of supplies (except ammunitions) according to the service, either

- major items: vehicles, armament, artillery, optics, parachutes, machines, etc
- or ordinary supplies: parts and components, tools, hardware, raw materials, ingredients, etc...

were taken over by the E.R.G. of Saigon

Articulated in two store companies, the E.R.G. assumed the excessively heavy task of acting as - a DEPOT OF BASE OF OPERATION, and

- an ARMY DEPOT

ACTIVITY OF THE E.R.G.

	1950	1951	1952	1953	1954
- Réceptions	32.000 T	38.000 T	79.000 T	105.000 T	125.000 T
- Expéditions	31.000 T	40.000 T	74.000 T	79.000 T	82.000 T
TOTAL	63.000 T	78.000 T	153.000 T	184.000 T	207.000 T

(Cf. Tableaux Annexes I-II-III)

The volume alone of these movements materializes fairly well the charges of the E.R.G.

These charges, however, are truly evaluated only if a precise description is made of the peculiar conditions under which the production and the management of the supplies were obtained.

1. Diversity of the Materials

The prevailing characteristic of the initial equipment of the Expeditionary Force was its heterogeneity; as far as the armament, the vehicles, the machine-tools and the tools were regarded, the Expeditionary Force was equiped with material of several nationalities:

U.S., French, British, German.

No doubt the homogenization of this equipment was pursued constantly, and sure but slow resluts were obtained (it was only early in 1953 that the German and especially the British vehicles were eliminated from the vehicle park).

2. Sources of Supplies

The diversity of the materials in use implied many sources of supplies; on the other hand these sources multiplied as a function of

- the form itself of the U.S. aid
- the impossibility to satisfy by one source alone any total and definite need.

We shall not mention the 1947-1951 period when every means available had to be used for the end in view (Japan, Australia, India, etc...).

The normal supply sources from 1951 to 1954 were:

- FRANCE: D.E.F.A., French Industry, German Industry, Purchase Missions in Washington, Tokyo
- U.S. AID: MDAP
  - SQE for the F.T.E.O.
  - SQG for the Nartional Armies

  MSP Nonspecifically military materials
  BULK SUPPLY PROGRAM
- INDOCHINA: Local purchases, Purchase missions in Washington, Tokyo.

The multiplicity of these sources is reflected in different processes used in establishing the orders, and especially in the shipments; the task of the E.R.C. was greatly complicated by such procedures as shipping documents, shipping conditions, marks, designations, or even different standards for the same material of identical use but from six to seven different origins.

Two supply sources require specialremarks:

- the local sources
- the Bulk Supply Program

Local Resources

Since the industrial equipment of the country was very limited, nearly all the material bought locally came from import sources.

The only local production supplies were practically

- woods and derivatives
- structural materials
- coal, oxygen, acetylene

It must be noted however that, because of the problems of internal transportation, the wood supply was always difficult so that in 1953-54 European or African wood supplies were considered.

Thus the theater of operations was very limited in its resources.

BULK SUPPLY PROGRAM

The Supplies delivered within the framework of the BULK SUPPLY PROGRAM corresponded neither to a particular request nor even to a possible need.

It consisted in a systematic attribution, each delivery under this program corresponding practically to the complete clearing out of an American Depot.

These deliveries comprized a large number of parts in 1, 2 or 3 specimens, the others by ten of thousands.

Some of these parts no doubt were very useful, but most of the parts delivered in large amounts, were in excess stocks in the U.S. Depots, and were in excess stocks in Indochina also; they increased uselessly and in considerable proportions at times the dead E.R.G. stocks.

It should be noted that this bulk supply program was in full swing late in 1953 and early in 1954 when the American Supplies of 2nd World War materials began to become exhausted in the U.S. and when many parts or combinations requisitioned under the F.A.M. agreement could no longer be delivered (N.O.I.D.).

3. Supplying Delays

The supplying delays (order - delivery) differ very much according to the sources.

a. P.M.A.

The P.M.A. deliveries (MDAP or MSP) were made as a rule within six months following the handing over of the requisitions to the American Services (except of course when the U.S. stocks were exhausted - NODI - or when all U.S. deliveries were practically suspended (January - February 1954).

b. France

The procurement of the materials on the basis of the Supply Plan was carried out under conditions which improved each year; but these delays in the delivery always remained excessively long.

Without mentioning the performings of the previous Plans, the 1953 Plan handed over to the Department in October 1952 was carried out under the following conditions:

- Delivery in Indochina July 1953 15 %
- Delivery in Indochina between July and October 1953 20 %
- Delivery in Indochina between October and December 1953 30 %
- Delivery in Indochina in 1954 35 %

This means that nearly the entire Plan supply was delivered in Indochina more than one year after establishing the orders.

Certain important portions of the supply plans (motors and components for U.S. vehicles) were procured two years after these plans were established.

As a matter of indication, in September 1953, the deliveries as a whole

- on the basis of Plan 52 (handed over to the Department late in 1951) were not yet finished

- on the basis of Plan 53 (handed over to the Department late in 1952) had scarcely begun.

At this time, September 1953, the E.R.G. possessed none of the following items:

- Motors, gear boxes, transfer, Jeep front axle
- Front axle, intermediate axle, rear axle 6 x 6 for Dodge
- Gear box
- Front, intermediate, read Banjo axles } G.M.C.
- Intermediate, rear split axles

If these delays of delivery are taken into account, in order to obtain the regular flow of supplies to the Territories, the level of the stocks to be held by the E.R.G. should have been exceptionally high: as regards certain supplies these important stocks were obtained in fact, but it was never the case for others in great number: during prolonged periods these supplies were lacking.

There were other consequences of these delays: the nearly permanent lag between the need and the supplies because of the quantitative and qualitative evolutions of the parks; when the supplies reached Indochina, they no longer corresponded to the needs of the time.

That was the evaluation of the system existing until 1954: the Department without Central Stores in order to provide the Theater of Operations with supplies depended entirely on the supplies within the framework of the contracts made each year in order to carry out the annual Supply Plan.

4. Importance of the Stocks

- The importance of the Vehicle Park (See Tables VI and VII in supplement)
- The diversity of the types of materials in use
- The delays of delivery of the Supply Plans,

suffice to define the importance of the stocks to be obtained by the E.R.G.

Certain exceptionally high consumptions also implied corresponding stocks: exceptional consumptions due to the state of the roads (or rather of the tracks), to the climate, to the extensive use of mines

- Tarpaulins : 1 tarpaulin for each vehicle, per year
- Batteries : 1 battery for each vehicle , per year
- Platinized screws : (over 2,000 sets of platinized screws Jeep - Dodge - G.M.C. monthly
- etc...

Despite the importance of these special consumptions, the volume of supplies of every kind (vehicle part, assemblies, general supplies, tools, ingredients, etc..) distributed for the mainenance of the vehicle Park of the whole Theater of Operations, remains very close to the theoretical rate of 2.5 kg for each vehicle each day.

	Total Park in Indochina	Tons of Supplies Distributed
1952	41.000 - v.	28.500 - T.
1953	52.000 - v.	41.500 - T.
1954	60.000 - v.	51.500 - T.

5. Conditions of Operation of the E.R.G.

The very heavy responsibilities of the E.R.G. were considerably increased by the insufficiency of the means of operation.

Regarding the covered surfaces, the storing areas of the facilities to handle the goods, it may be said that the means strictly necessary were never at the right time at the disposal of the E.R.G.

During the last three years the E.R.G. had at its disposal the following covered surfaces in the form of stores (only the stores, exclusive of auxiliary buildings, quarterings, offices, workshops, etc.) and external storing areas:

	1952	1953	1954
- Covered surfaces in the form of stores	34.000 m^2	60.000 m^2	75.000 m^2
- External areas	96.000 m^2	104.000 m^2	131.000 m^2

The corresponding supplies to be stores in covered surface were:

	1952	1953	1954
- Average permanent stock	38.000 T	57.000 T	80.000 T
- Instantaneous displacement (about 20%)	7.600 T	11.400 T	16.000 T
	45.600 T	68.400 T	96.000 T

that is approximately 1.3 ton per square meter of covered surface.

This average may appear to be acceptable at first: practically it proved to be rather insuffient because the E.R.G. never had at its disposal enough means to organize its storages under normal conditions, and to organize as best as possible the covered surfaces that it possessed.

Practically it was necessary to wait for the cease-fire in order to provide the E.R.G. with the sufficient means, personnel and working equipment -(shelves, racks, hoisting gears, handling appliances, lifts, etc..).

As a matter of information, the E.R.G. possessed the following number of lifts: 1952 : 11 1953 : 23 1954 : 31, whereas twice as many were needed.

- Diversity of Supplies:
- Car Armament Artillery Parachutes Boats Light airplanes Machine-tools Tools Hardware General Supplies Raw Materials Ingredients Printed matter - Office Suuplies Coffins etc..

- Necessity to possess retail stores for all the supplies
- Climate requirements (important aeration) : tarpaulins, textiles, parachutes, etc...

Storage in the Open Air

The open air storage areas
- 96,000 m^2 in 1952
- 104,000 m^2 in 1953
- 131,111 m^2 in 1954

were insufficient especially because of the impossibility to fully use the covered surfaces.

"TABLE ANNEX I"

a. Activity of the E.R.G.
b. Receptions, shipments, all materials
c. Materials
d. Receptions
e. Shipments
f. Vehicle supplies
g. Artillery, Armament, Parachute supplies
h. Machine-tools
i. Automotive vehicles

TABLE ANNEX I

ACTIVITY OF THE E.R.G.

(Receptions, Shipments, all Materials)

MATERIELS	RECEPTIONS				SHIPMENTS			
	1951	1952	1953	1954	1951	1952	1953	1954
1°) Vehicle Supplies	-	24.800	49.600	60.000	-	27.000	39.000	47.500
2°) Supplies:	-	4.900	6.000	7.000	-	3.500	4.500	5.500
(- Artillery (- Armament (- Parachute	-	4.900	6.000	7.000	-	3.500	4.500	5.500
3°) Machine-tools	-	4.400	9.000	10.000	-	1.500	2.500	3.000
4°) Automative Vehicles	-	45.000	40.000	48.000	-	42.000	33.000	26.000
TOTAL (in tons)	-	79.100	104.600	125.000	-	74.000	79.000	82.000

"TABLE ANNEX II"

"TABLE ANNEX III"

a. Details of the 1952-53 receptions
b. French parts and assemblies
c. General supplies
d. U.S. Parts and assemblies
e. U.S. armored parts andassemblies
f. Vehicles
h. Armament
i. Artillery
j. Harness and equipment
k. Machine-tools, tools
l. Parachutes

II AMMUNITIONS SUPPLY

Evolution of the Stock of the General Reserve

The theoretical level of the ammunitions stocks of the General Reserve was normally determined by the Headquarters; it varied in time, and according to the sources of supply and to the types of ammunitions, between six and twelve consumption months. Taking into account the important variations observed regarding the consumption rates of certain types of ammunitions, and the irregularities indelivery on the part of the U.S. or of France, this level was subjected to important fluctuations.

The diagram enclosed, for the period between January 1951 and August 1954, gives the variations in the ammunitions stocks of the General Reserve; it also contains

- the curve of variation of the monthly consumed tons
- the anount of tons of ammunitions received in 1951, 52, 53 and 54.

The examination of this diagram permits the following remarks:

TABLE ANNEX II

ACTIVITY OF THE E.R.G.

(Receptions, Shipments, Vehicles.)

MATERIALS	RECEPTIONS				SHIPMENTS			
	1951	1952	1953	1954	1951	1952	1953	1954
Automative Vehicles								
a) - Number	-	15.500	10.700	12.900	-	13.800	10.800	12.200
b) - Tons	-	45.000	40.000	48.000	-	42.000	33.000	26.000

TABLE ANNEX III

ACTIVITY OF THE E.R.G.

(Details of the 1952-53 Receptions)

MATERIELS	1952	1953
- French Parts and Assemblies	-	1.303
- General Supplies	5.254	8.976
- U.S. Parts and Assemblies	10.146	25.091
- U.S. Armored Parts and Assemblies	3.846	10.824
- Pneumatics	5.547	3.471
- Vehicles	45.542	40.090
- Armament	2.529	2.256
- Artillery	800	1.555
- Harness and Equipment	824	773
- Machine-tools, Tools	4.407	8.997
- Parachutes	781	1.397
TOTAL	79.676	104.733

1. Regarding the Amount of Tons of General Reserve Ammunitions

- Progressive but relatively low increase in 1951 and 1952 = total amount of tons from 15.000 - 37.000 tons

- Very important increase during 1952, from 37,000 tons to 83,000 tons; this increase was necessary because of the intensification of the operations and of the new conditions of the Indochina war; the existing depots had to be extended and new depots had to be created

- Sudden decrease from 83.000 tons to 53.000 tons from December 1953 to March 1954 as a result mainly

- from the placing of an important amount of ammunitions for the Laos and High Plateaux operations, and for the defense of the entranched camp of DIEN-BIEN-PHU

- from the relatively low importance of the amount of ammunitions received during this period: 7.500 tons from the U.S.

- from the very important increase from May 1954 to the end of hostilities when the tonnage of the ammunitions of the General Reserves was as high as 91.700 tons.

2. Regarding the Consumptions

- The curve of the monthly consumptions exhibits a pattern similar to that of the tonnages; the monthly consumptions varied from 1.500 to 6.000 tons during 1951-1952.

- The peaks observed during 1953 and 1954 correspond to the placing of the ammunitions for the different operations:

- January 1953: retranched camp of Na-San - Qui Nhon
- April 1953: High Region, North Laos and S.W. Tonkin Delta ("Hautes Alpes" Operation)
- October 1953: "Mouette" Operation
- December 1953: Viet-Minh attack in Central Laos
- January 1954: Central Laos - "Atlante" operation (Central Vietnam) "Roussillon", "Ariege", "Anjou" (South Vietnam) operations
- April 1954: retranched camp of Dien-Bien-Phu
- July 1954: "Auvergne" operation - North Vietnam retraction.

A comparison between the two curves indicates a confortable safety margin for the ammunitions as a whole. For a certain number of ammunitions indicated below, however, the supplies were nearly constantly critical because of the insufficient rate of deliveries especially from France, concerning:

- 7.65 C cartridges
- OF and D 37 grenades
- lacrimator grenades
- M.K.11 grenades
- complete sets for 50-grenade launchers
- complete sets of 60 and S1 illuminating projectiles
- complete sets of 25 FDPS, 105 L 36 and 120 explosives
- artificial signals
- illuminating traps

The high consumption of artillery ammunitions - especially of 105 H.M. 2 - during the first half year of 1954, due to the defense of D.B.P.

and to the V.M. attack in Central Laos, revealed the danger of the rear bases (USA and France) which were too far from the theater of operations. Only the U.S. and Japanese stocks made it possible to straighten the situation and to maintain the rate of the last operations. Following these difficulties, the formation of an intermediate base at Singapour was considered.

The development of the ammunitions tonnage of the General Reserve required an almost continuous adaptation of the storage facilities.

In 1951-52 the Indochina depots were ruled by the Instruction of May 1st, 1925 concerning the Ammunitions Service during the peace time in the colonies. Later on the instruction of 2.7.1920 (first half-year of 1953) and the instruction of 2.25.1953 (2nd half-year of 1953) were applied.

The General Reserve ammunitions whose tonnage reached 37,000 tons late in 1952, were stored in the existing depots which are distributed as follows:

Laos

Ventiane Depot	300 t
Savannakhet Depot	500 t

Cambodge

Stung-Meanchey Depot	420 t

North-Vietnam

Tonkin Base of Operation - two stable depots Kien-An I, Kien-An II - one transition depot: melted cements - one annex depot: Doson	16.000 tons

Cambodge)
) No change
North Vietnam)

Central Vietnam: internal extension of the Tourane II depot: 5.600 tons

South Vietnam: Maintenance of the Khan-Hoi depot

Extension of the Tan-Tuy-Ha depot: 10.000 tons

Opening of the Go-Vap depot: 7.650 tons

Opening of a depot at St. Jacques Cape depending on the creation of a base.

In fact, on July 1st, 1953, the only increase of capacities obtained were: (in North-Vietnam the reduction of the capacity of the Kien-An depot, resulting from the disaster of April 1953 (V.M. attack) was compensated by the provisory installation of the Kien-An III depot, (use of the honeycomb structure of the airfield)):

- depot of T. T. HA 10.000 tons
- operation of the Go-Vap depot 6.850 tons

which raises the possibilities of the General Reserve to 72.000 tons

At the same date the tonnage of the General Reserve ammunitions reached 75.000 tons, and 45.000 tons of ammunitions were expected during the second half-year of 1953, from the U.S. as well as from France.

New extensions and creations of depots were studied:

- new extension of the Tan-Tuy-Ha depot..... 11.000 tons

(of out which 10.200 tons as a loan to the Air Force or to the Navy)

- extension of the Phu-Tho depot 7.600 tons
- extension of the B.O.T.K. depots 15.000 tons
- creation of the Seno depots 1.500 tons
  Wattay 850 tons

The realizations carried out on the basis of this program during the second half year of 1953 raised the capacity of the General Reserve to 80.000 tons.

The tonnage of the ammunitions remaining in the General Reserve on 1.1.1954 was 83.000 tons.

No serious difficulty arose any longer in this domain until the cease-fire.

The problem of storing in the Saigon and Tourane depots the ammunitions evacuated from North Vietnam was resolved

- by means of internal extensions of the existing depots (TT, HA, Go-Vap, Tourane II)
- by waiving certain storing regulations
- by creating campaign depots and provisional storing depots.

SUPPLYING OPERATION

The articulation of the ammunitions supply during the operations, as defined by the instruction No III.EMIET/4/1/4/S of March 11, 1953 was essentially characterized by decentralization, and thus by great adaptability.

Because of the geographical configuration of Indochina and of the form assumed by the operation on that theater, the ammunitions manoeuvres were carried out mainly at the Territory echelon.

There was advantage in fact in advancing the ammunitions as close as possible to the cambatant, without however multiplying the small depots whose position was very vulnerable and whose operation increased appreciably the territorial personnel requirement.

Each Territory Commander had to have at his disposal enough ammunitions to enable him to re-complete, according to the consumption requirement, the initial allowances of the units under his authority, or eventually to grant a supplementary allowance to one or several formation in a determined tactical situation.

The supplying methods used to maintain the levels gave excellent results. The circuit adopted was: E.R.G. MU - R.G. depot adapted to a territory - mai depot - secondary depot or sector - units.

It seemed necessary, however, to entrust the management of the main depots and of the depots near the Air supply units to specialists of the Material Service. This was the case in North Vietnam for the main depots; the system would have been generalized with advantage.

The supply of ammunitions required heavy tonnage transportations whose safety had to be ensured under every circumstance. It assumed different aspects according to the regions considered as a function of the relative importance of the types of transportation in these regions: tracks, road network, river network, railroad, air-ground organization.

It is useful to give here some indications concerning the conditions of use of some of these types of transportation peculiar to Indochina. A large part of the road network involves a one-way traffic exclusively, hence its considerable limitation (still increased by the poor state of some roads); the capacity of the railroad transport is, for many reasons, (ground planning, railroad layout, prevailing one-way traffic, characteristics of the rolling stock), quite below that of the European railroads.

Certain regions are served by trails only, and the use of "breles" (ropes ?) or coolies is necessary. These types of transportation offer the following possibilities:

- A mule in one day can carry a 80 kg load on a 80 km distance.

Coolies have been used in certain regions (High Plateaux, Laos, Tonkin) intensively to transport ammunitions. They are used on the following bases:

- Two coolie-carriers can displace two boxes (105 mm, 4 complete sets) on a 30-35 km distance

- One coolie with the help of a balancing pole can displace two boxes (60 mm) (10 complete sets for mortars) on a 30-35 km distance

- One coolie can carry on his head a box of 20 rockets (2.36 inches) on a 30 km distance.

As regards the air traffic, beside parachutings especially on D.B.P., the aircrafts used were mainly Dakotas which are able to transport about 2.5 tons of ammunitions It is possible for 10 - 20 aircrafts of this make to be used simultaneously on the average existing grounds, which involves a 25 - 50 ton yield per rotation.

III. REPAIR OF MATERIALS (4th and 5th echelons)

From 1947 - 1954 the working conditions of the 4th and 5th echelons (vehicle reconstruction and assembly inspection) underwent a certain change.

Until 1951 Indochina lived exclusively by her own resources. Somehow or other these 4th and 5th echelon operations were carried out in that country, since no assembly or vehicle were sent abroad for repair.

No soon than in 1951 it was decided to s end to France armored items (4th and 5th. echelons) for repair; this was due to the constant increase of the needs exceeding by far the possibilities in Indochina which remained about the same; thus the armored vehicles which could not be reconstructed and the assemblies which could not be renovated in Indochina were sent to France.

Finally in 1952 this measure was extended to all the U.S. - GP vehicles.

On the other hand the 4th U.S.-GP echelon continued to be taken care of entirely in Indochina.

From 1948-1951 the vehicle reconstruction and the assemble examination were carried out in Indochina in the different units of the Material, either at Saigon or at Hanoi.

The main mission to carry out at Saigon most of the 4th and 5th echelon operation was entrusted to the 1st Battalion of the of the Material (1st B.R.M.) formed in 1951.

Three units of this Battalion performed these operations in workshops that were equiped only very gradually

- 1st C.L.R.A., - 4th US-GP echelon
- 1st C.R.E. - 5th US-GP echelon
- 1st C.R.E.B. - 4th and 5th Armored echelons.

PRODUCTIONS

The production of the 4th and 5th echelon workshops in Indochina underwent the following progressive changes:

	1948	1949	1950	1951	1952	1953	1954
Vehicles Reconstructed at the 4th Echelon	900	1.000	1.636	1.172	1.064	2.690	4.750
5th Echelon Assemblies	1.000	2.500	12.700	13.950	6.800	12.450	13.100

(The annex tables IV and V give information concerning the 4th and 5th echelon productions from 1950 to 1954).

These production do not reflect the possibilities of the Workshops: in fact from 1946 to 1953, the production of chains, of the 4th echelon especially, remained much below the capacities of production of the workshops only because of the lack of supplies: it may be said that during these five years as far as chains were concerned, supplies were waited for; 1952 was the most critical period when their production fell to 50 % of their capacity.

Not before 1954 was it possible to make a full use of the possibilities of the workshops and to reabsorb the parks not taken care of so far.

OVERHAULING

One must bear in mind the important charges laid upon the 3rd and 4th echelon workshops by the overhauling of the vehicles after unshipment and before going into service.

Nearly half of the vehicles of general use, once unshipped, had to be subjected to 2nd and 3rd echelon operations; the process was easy enough but not negligible indeed, as in 1952 for instance when about 6.000 vehicles were taken care of.

In the case of the armored vehicles, these operations are much longer and more difficult (although one must take into account the special arrangements

made on certain armored vehicles used in Indochina, overarmoring of the A.M.'s and L.V.T.'s, installation of a reverse-gear on AM, etc..).

Practically, the number of the armored vehicles that were overhauled each year was nearly equal to the number of armored vehicles reconstructed at the 4th echelon; the overhauling of these vehicles involved 35 % of the activity of the C.R.E.B..

Table Annex IV 4th echelon Reconstruction

a. Year b. Motorcycles c. Miscellaneous d. Special

e. Armored vehicles f. on wheels g. semicarterpillar

h. amphibious i carterpillar

Table Annex V 5th Echelon Renovation

a. Year b. Motors c. Assemblies d. Special e. Armored vehicles

TABLE ANNEX IV

4th ECHELON RECONSTRUCTION

		U.S. G.P.						ARMORED VEHICLES					
Year	Motor-cycles	Jeep	Dodge	G.M.C.	Miscella-neous	Total	Special	On Wheels	Semi-carterpillar	Amphibious	Carter-pillar	Total	TOTAL GENERAL
1948	-	-	-	-	-	900	-	-	-	-	-	-	900
1949	-	-	-	-	-	1.000	-	-	-	-	-	-	1.000
1950	117	371	193	507	248	1.319	35	76	36	18	35	165	1.636
1951	82	372	31	385	173	961	61	41	25	-	2	68	1.172
1952	132	395	66	343	34	838	13	23	21	28	14	86	1.069
1953	91	693	377	1.330	-	2.400	16	8	55	82	5	150	2.657
1954	34	1.059	1.604	1.787	-	4.450	27	79	68	90	4	241	4.752
TOTAL	456	-	-	-	-	11.868	152	-	-	-	-	710	13.186

TABLE ANNEX V

5th ECHELON RENOVATION

Year	DIVERS		U.S. G.P.		SPECIAL		ARMORED VEHICLES		TOTAL GENERAL
	Motors	Assemblies	Motors	Assemblies	Motors	Assemblies	Motors	Assemblies	
1948	-	-	-	-	-	-	-	-	1.000
1949	-	-	-	-	-	-	-	-	2.500
1950	489	970	2.138	8.561	12	55	118	360	12.703
1951	364	961	4.011	7.945	52	159	130	323	13.945
1952	87	83	2.004	4.005	17	34	136	424	6.790
1953	102	115	3.410	7.898	78	136	162	557	12.458
1954	30	33	3.831	8.115	84	144	324	532	13.093
TOTAL	-	-	-	-	-	-	-	-	62.489

CHAPTER III

PROBLEMS CONCERNING THE SECURING AND MAINTENANCE OF THE MATERIALS

A. ARMORED VEHICLE PARK

PROGRESSIVE CHANGES OF THE VEHICLE PARKS

1. From 1947 to 1954 the vehicle park in Indochina increased constantly: in seven years it passed from 15.000 to 60.000 vehicles.

- 1947 : 15.000 vehicles
- 1948 : 17.000 "
- 1949 : 20.000 "
- 1950 : 21.000 "
- 1951 : 26.000 "
- 1952 : 41.000 "
- 1953 : 52.000 "
- 1954 : 60.000 "

2. During the same period this park, consisting of vehicles of different nationalities (French, English, U.S., German) tended to become homogeneous (See Annexes).

The German vehicles were rather rapidly eliminated; this was not the case with the English vehicles..

In 1947

- 2 Divisions of the Expeditionary Force were equipped with U.S. vehicles.
- 1 Division was completely equipped with Brithish vehicles.

In 1949

- One fifth of the park remained British.

Not before 1953 was it possible to practically eliminate the British vehicles and to obtain a uniform park consisting only of French and US vehicles.

- 85 % U.S.
- 15 % French.

3. Until 1950 the vehicle park in Indochina kept its classical composition:

- vehicles of general use
- special vehicles
- armored vehicles
- trailers

As will be explained later on (See paragraph B and C) it was to be completed

- in 1950 by river crafts
- in 1953 by Light Artillery Observation Aircrafts

From 1950 to 1954 this river park passed from 240 to over 1500 crafts from the simple "MYTHO" boat to the 450 ton barge.

As for the Light Observation Airplanes they were not to exceed 85 specimens.

FORMATION OF THE ARMORED VEHICLE PARK

From 1945 to 1954 the Armored Vehicle Park consisted as a whole of military vehicles used during the 1939-1945 War.

In addition to the Renault trucks 5 and 7 T of a commercial type, which began to be used in 1952, the only recently made semimilitary vehicles brought to Indochina were the

- Light Renault 4x4 TT trucks
- Light Renault 4x4 TT, 3 T.5 trucks

brought in 1953 and 1954; only the first were used.

During the nine-year campaign no renovation of the park took place.

Only the types of material used were subjected to some change; vehicles of certain types were practically eliminated such as:

- Light cartepillars T.16
- A.M. Panhard
- M.5 and M.36-B.2 tanks
- Automotives M.8

The Table Annex IX gives information concerning the changes from 1950 to 1954 in the main types of vehicles used in Indochina.

ADJUSTMENT TO WAR CONDITIONS

1. General characteristics of use

- The ground: rocky, mountain trails
  flooded: rice-fields
- The roads: insting or full of muddy holes
- The intensive use of mines

subjected the rolling stok to exceptionally hard conditions.

As regards the armored vehicles or the road vehicles the wear and deterioration of the rolling trains as a whole - suspension - exceeded by far the normal expectations upsetting all anticipations concerning the supply of replaceable parts and of those usually nonreplaced.

Table Annex 7 gives an idea of some very high consumptions recorded between late 1953 and July 1954.

2. Special Characteristics

Light Armored Car M8

- The absence of a reversing gear which deprived the A.M.'s of much of their mobility when moving on covered grounds (bush, forest) and reduced considerably their capacity to eschew ambushes on an interrupted track. From 1952 the AM's were equipped with a reversing gear.

- Insufficient armoring of the fromt compartment against mine effects; these compartments were provided with an additional sheet plate armoring 8 mm in thickness

- Necessity to possess adjustable headlights

- Fragility of the steering box

HALF-TRACK

- The use of the so-called English carterpillars (consisting of carterpillar elements connected together by bolts, each element consisting of chains instead of ropes, covered with rubber) gave poor results only. They were too heavy which caused a rapid wear of the rollers. The carterpillars themselves became rapidly worn.

- Insufficient resistance of the floor against mine explosions: the floors were armored with a protective metal plate.

This process was soon replaced by the use of "anti-mine carpets" in nearly all vehicles.

The anti-mine carpets, consisting of 12 mm-thick rubber plates resting on cloth tubes filled with sand and with a space between them (air mattress), offered an effective protection of the riders against the effects of the impact due to mine explosions.

M 24 TANKS

- Metal carterpillars quite suitable for rocky grounds
- Rubber carterpillars quite suitable for ricefields
- Fragility of the drive system of the fans
  - rupture and deterioration of the cardan joints
  - rapid wear of the bearings
  - lack of motors for M.24 tanks, so that motors of M.5 tanks had to be transformed into M.24 motors (this was rather easy).

AMPHIBIOUS VEHICLES:

1. M 29-C

- Light hull with low impact resistance and easily rusted
- Rapid wear of the carterpillars: 300 - 500 miles - the replacement of the carterpillars is time-consuming and difficult
- Carterpillar unsuitable for grassy and wet grounds; grass becomes packed in the rolling train, hence deterioration of the rollers, sprocket wheels, live pulleys
- Fragility of the clutch
- Good climbing capicity (30 °, 40° slopes) but low ability to clear clean-edge obstacles; they are stopped by a 30 - 40 cm clean edge.

2. L.V.T.

- Fragility of the floor
- Lack of sturdiness of the motor
- Transmission parts (clutch, gear box, differential) unsuitable for the efforts required by stickiness of the grounds
- Rapid wear of the rubber rollings (front and rear rolling especially)
- Locally made hooped steel rollers gave ground results.

TABLE ANNEX VI

PROGRESSIVE CHANGES OF THE ARMORED VEHICLE PARK IN INDOCHINA

Designation of the Materials	1947	1948	1949	1950	1951	1952	1953	1954
Automotive Vehicles	11.000	12.800	15.100	15.700	19.400	29.000	36.760	44.350
Armored Vehicles	1.000	1.200	1.650	1.950	2.340	3.170	3.610	3.590
Trailers	3.000	3.000	3.250	3.100	4.230	7.850	10.560	10.720
River Park	0	0	P.M.	240	270	450	1.340	1.560
TOTAL	15.000	17.000	20.000	21.000	26.000	41.000	52.000	60.000

TABLE ANNEX VII

COMPARATIVE CHANGES OF THE F.T.E.O. PARKS AND ASSOCIATED STATES PARKS

PARKS	1947	1948	1949	1950	1951	1952	1953	1954
F. T. E. O.	15.000	17.000	20.000	21.000	24.500	33.500	37.000	38.000
Associated States	0	0	0	0	1.500	7.500	15.000	22.000
TOTAL	15.000	17.000	20.000	21.000	26.000	41.000	52.000	60.000

TABLE ANNEX VIII

CHANGES IN THE PARKS ACCORDING TO NATIONALITIES

YEARS	PARK TOTAL	U. S.	French	English
1949	29.000	73 %	7 %	20%
1950	21.000	80%	8 %	12 %
1951	26.000	81 %	12 %	7 %
1952	41.000	86 %	11 %	3 %
1953	52.000	88 %	11 %	1 %
1954	60.000	85 %	15 %	P. M.

TABLE ANNEX IX

PROGRESSIVE CHANGES OF THE MAIN TYPES

OF VEHICLES USED IN INDOCHINA

Designation of the Materials	1950	1951	1952	1953	1954
U.S. G.P.:					
-Jeep	3142	4324	6973	8453	9852
-Dodge (1)	3292	4002	7409	9434	11465
-G.M.C.	5215	6065	7954	11156	14783
Armored Vehicles Becomming Eliminated					
-Light Armored Cars Ford T 16- MK 2	101	84	99	63	40
-Scout-Car Humber	82	39	18	3	1
-Half-Track Hanomag	1	22	32	43	9
-A.M. Panhard & Coventry	213	208	176	46	9
-Light Tank M 5	33	162	136	132	97
-Medium Tank M4 -M4-A.1	-	61	59	75	64
Armored Vehicles That Were Kept in Service					
-Scout-Car U.S.	426	476	583	710	703
-Half-Track	516	593	928	959	850
-A.M. M.8-M.20	128	153	310	622	600
-T.D. M.36-B.2	-	10	82	82	79
-Light Tanks M.24	-	30	90	115	212
-Automotive Vehicles 75 mm M8	47	88	84	180	222
Amphibious					
-Cargo-Carrier M. 29-G	303	322	456	436	438
-LVT.4 et LVT-A.4	16	84	112	140	182
Vehicules Francais:					
Ford Trucks	629	604	549	422	407
Light Trucks PL.20	622	377	645	766	727
Renault Truck 3/4-T.	-	-	2	276	635
Renault Trucks 3T.5	-	-	-	-	31
Renault Trucks 5 T.	-	-	462	711	872

(1) inclusive of light Chevrolet of T 5 trucks)

TABLE ANNEX X Exceptional Consumptions

a. Materials

b. Monthly consumption (only 3rd echelon)

c. Renault trucks

d. Left AR spring

e. Right AR spring

f. AR spring

g. Carterpillars

h. Rollers

i. Sprocket wheels

B. RIVER PARK

From the outset of the hostilities, in Cochinchina and Tonkin the Expeditionary Force had to use the only roads having sufficient density, that is the hydrographic network.

At the beginning local crafts such as sampans, junks, were used in carrying supplies to isolated posts or sectors.

Then the rivers were used more and more, because the lack of a sufficient road network, for the unloading and transportation even to remote places of the heavy ammunitions and supplies.

In 1948 the F.O.M. vedette boats began to be used. These metallic crafts (8 - 11 meters in length) which later on were armored, gave efficient protection to the boats on the large waterways and permited certain operations in depth.

TABLE ANNEX X

EXCEPTIONAL CONSUMPTIONS

MATERIALS	MONTHLY CONSUMPTION (only 3rd Echelon)	OBSERVATIONS
Renault Trucks		
Left AR Spring	115	
Right AR Spring	80	
G.M.C. (13.000 Vehicles:		
AR Spring (G.508.77.35286 et (G.508.03.89792	400	
L.V.T. (100 in Service):		
Carterpillars	100	
Roller	300	
Sprocket Wheels	30	
M.29-C (200 in Service):		
Carterpillars	60	
Rollers (G.179.62.66641)	300	
Sprocket Wheels (G.179.56.28459)	80	

Finally the Units operating in zones possessing a large number of waterways were provided with river boats of different tonnages, so as to enable them to combat in rivers and in the "rachs".

In 1950 the river park, which had begun with ill-assorted and ill-adapted crafts, assumed its definitive shape when it was provided with crafts suitable for the different missions required by the conduct of the operations.

a. Composition of the River Park

According to their use, the types of crafts making up the river park can be classified in different categories:

1. Sector River Crafts

This material is used by the "corps de troupe". It is allotted to a determined sector and is organized for the circulation in the rivers, "rachs" and arroyos.

Its purpose is to permit the transportation of combat groups, of material supplies, of food and ammunitions.

It permits deliveries, observation, evacuations.

This park is provided with different materials of very light tonnage:

- junks and sampans possessing certain characteristics
- shallops (7 - 10 m)
- "MYTHO" boats, or general use crafts designed by the Material Service (wooden hull, 6m-8m, Jeep motor).

2. Transportation River Boats

In principle this material is used by the river Units of the Army Service Corps.

They are French made landing craft mechanized (L.C.M.); they are rapid, weigh 30 T are completely metallic and partly armored, 17 m in length and permit the transportation of 60 equipped men or of two 15 T tanks.

3. Combat River Boats

These crafts began to be used in the Units, especially in the Armored Elements and in the Cavalry. They are armored F.O.M. vedette-boats, 8 - 11 m in length, used for the protection of the vessels under escort and for the support of operations.

4. River Boats for Harbor Operation

These materials are used in the bases for the unshipments and manoeuvres. They are essentially

- trailers
- automotive barges or towed barges
- L.C.T.'s (landing craft tanks)

Successively two vessels, one of which a L.C.I. (Landing Craft Infantry) were used for red cross transportation to evacuate the wounded, especially from Saigon to the sea.

b. Progressive Changes of the River Park (F.T.E.O. and E. A.)

	1948/49	1950	1951	1952	1953	1954
Vedette-boats (8 -11 m) and Observation	19	52	92	113	175	197
L.C.I. Red Cross	-	-	1	1	1	1
L.C.T. ou L.S.U.	-	-	2	2	2	2
L.C.M.	-	-	3	85	123	198
Trailers	-	-		4	4	4
Automotive Barges and Towed Barges	15	14	15	30	22	45
Miscellaneous Crafts	76	46	175	228	1.018	1.114
	110	112	288	463	1.345	1.561

c. Formation and Maintenance of the River Park

It was not possible to design and develop these materials.

Except the "MYTHO" boat designed and developed by the Material on the basis of locally built hulls and of "Jeep" motors, the other crafts were the objects of contracts made mainly in France.

Certain types of crafts (barges and L.C.M.) were sent prefabricated to be assembled in Indochina

Others (F.O.M. vedette boats and L.C.M.) were adapted to their mission before bein used (armoring, armament).

More than the development and adaptation of this park, its maintenance proved to be complex.

As a rule for all the types the wear of the material is rather rapid. Because of circumstances it was not always possible to use the park according to requirements.

On the other hand the nature of the waters and deposits in suspension in these waters cause a rapid corrosion of the hulls and of the immerged mechanical parts.

Hence the maintenance problem arose quickly along with difficulties due to

- the extreme dispersion of the park
- the "watertight" partitioning of a large part of the river network.

The maintenance and repair of the river crafts were taken up by the "River Sections" formed inside the Material Maintenance Medium Repair Company:

- In the North at Nam-Dinh, Hanoi, Haiphong, Seven-Pagodas
- In the Center at Hue, Tourane, Nhatrang, Savannakhet
- In the South at Cantho, Mytho, Saigon, Phom-Penh

In the North and in the Center these workshops carried out the maintenance of the crafts

- used in the sectors (inclusive of 5th echelon)
- used for transportation and combats (inclusive of 4th echelon).

In the South, because of the importance of the obligations, one River Craft Maintenance Co (C.R.E.F.) was formed in order to ensure

- the maintenance up to the 4th echelon inclusively of the river crafts used for transportation and combats
- the preparation for use and the storing of the new or renovated materials.

On the other hand, within the framework of an agreement between the Ground Force and the Navy, a pool of their respective means and resources was organized in order to ensure

- the distribution at the 4th echelon of certain types of crafts (CM-LCI-LCT)
- the renovation (5th echelon) of the naby motors (Renault-Gray Marine)
- the maintenance of the harbor operation crafts (towboat, etc).

Finally certain important and special works,

- assembly or preparation of large crafts from prefabricated elements
- repair of vessels exceeding a certain tonnage

were carried out by the local Civilian Sector on the basis of particular agreements.

C. LIGHT ARTILLERY AVIATION (A.L.O.A.)

1. HISTORICAL SURVEY

In 1945 at the arrival of the 9th Colonial Infantry Division (9th D.I.C.) the Artillery Observation was carried out by "Piper Cub" L.4 aircrafts.

These aircrafts not strong enough for a tropical and mountainous country were replaced by "Morane 500" aircrafts (previously the German Fiseler Storch); these low speed aircrafts are relatively heavy.

In April 1954, the first "CESSNA" L 19 aircrafts arrived and replaced the Moranes 500.

In August 1954 the A.L.O.A. was entirely equipped with these new aircrafts which are the best Artillery Observation airplanes over that Territory, because of their flight qualities and power reserve during take-off.

2. GENERAL CHARACTERISTICS OF THE AIRCRAFTS USED

MAKE AND TYPE	H.P.	Useful Load in kg	VELOCITY Fabric km/h Maximum	VELOCITY Airframe km/h Minimum	Rise en m/s	OBSERVATIONS
Piper Cub L 4	65	150	130	75	+ 1	Fabric Airframe
Morane 500	240	390	140	60	+ 2	Fabric Airframe
CESSNA L 19	213	225	170	80	+ 4	Entirely metallic

3. LOGISTIC SUPPORT

The Artillery Observation Aviation in Indochina consisted of four Air Groups (GAOA). These formation belonged to the Air Force which supported them.

The "Decret Ministeriel" of March 3, 1952 assigned the ALOA to the Ground Force from March 1st, 1954. The maintenance at the 3rd and 4th echelons would be carried out by the Material Service.

As regards Indochina:

Until January 1st, 1953 the material repair and renewal were carried out by the Air Force entirely. Only the flying personnel was combined (Air-Ground).

On January 1954 and until the allotment of the L 19 aircrafts, the logistic support of the ALOA was always ensured by the Air Force, although invoicing on the part of the Ground Force was involved. The Ground Force lent specialists to the Air Force.

Since the arrival of the L 19 aircrafts (April 1954) all the supporting charges of the ALOA were taken up by the Material Service of the Ground Force.

Two Sections for the maintenance of the ALOA aircrafts were created on July 1, 1953, the 1st SR-ALOA and the 2nd SR-ALOA, plus a Base store group.

The number of aircrafts to support for each one of these Units should be 30 (in fact the number of aircrafts assembled, delivered or ready for delivery was 53 only). The aircrafts of the ALOA performed altogether 1.500 flight hours per month on the average.

a. Problem of the Specialized Personnel The arrival from France of the personnel specialized in "Light Airplanes" occurred within the required time.

On January 1st, 1954, the first SR. ALOA possessed 100 % of its specialized personnel.

On March 1st, 1954, the 2nd SR. ALOA was 90 % of its specialized personnel.

The specialized helpers were taken from the Automotive Tank Maintenance Units and trained with Air Force Materials in the Air Force Parks where certified specialists had arrived from France in support.

b. Problem concerning the Airplane Replacement. A difficult problem was raised by the delivery of supplies for L 19, interrupted by the "cease fire".

Only 40 % of the anticipated supplies were delivered; a shortage of many consumption parts began (tires, magnetos, etc..) when the cease fire occurred.

c. The Tool Equipment Problem. The workshop tool equipment ordered in France in June 1953 and March 1954 arrived in Indochina late in 1954 only.

4. COMPARISON BETWEEN THE MORANES 500 AND THE CESSNAS L 19 FROM THE MAINTENANCE POINT OF VIEW

From the "maintenance" point of view the L 19 airplane proved to be better adapted to the particular conditions of the country than the Morane 500.

Two difficulties were involved in the use of the Morane 500:

- Rapid relaxation of the covering
- Abnormal corkscrewing of the wooden propellers.

Comparing the time spent in the maintenance of each one of the two types of aircraft emphasizes the superiority of the L 19: The daily maintenance for a 1 hour flight requires 1 mechanic's hour for the L 19 as compared with 8 for the Morane 500. The periodic examination for the 60 and 120 flight hours require respectively 13 and 22 mechanic's hours for the L 19 whereas the same operations for the Morane required 80 and 130 hours.

D. ARMAMENT AND OPTICS

a. GENERAL FEATURES OF THE ARMAMENT PARK USED IN INDOCHINA

Armed Units of American, English, French materials arrived in Indochina in 1945-46. During the same period materials of different origins (Japanese, German, Chinese) used in the Japanese Army were recovered; later on the Units brought in support of the Expeditionary Force were provided with materials taken from the reserves in France.

Finally, the supplies in armament, artillery and optics materials were obtained from different sources:

- French cabrication, procurements from the French Army
- Foreign aid: US, England, Canada, Australia.

Efforts were made from 1952 to eliminate from the Battle Corps Units the old armament; political reasons, however, favored the continued used of these armaments in the supporting forces.

Thus a large and diversified number of types of armaments were maintained until the end of the hostilities on the Indochinese theater of

of operations in each category of armament, artillery and optics materials.

For instance the enclosed Table (?) gives, for the different categories of small size armament materials:

- the number of F.T.E.O. weapons used or in store
- the number of weapon types
- the number of modern weapons (with indication of the percentage)

There is no less diversity in the optical and topographical materials.

b. RESISTANCE OF THE MATERIALS

It can be said that as a rule no serious study concerning the adaptation of the material to the special conditions of use on the Theater of Indochinese Operations was conducted.

The Expeditionary Force, involved at the beginning in a colonial war against an enemy equipped only with guerilla weapons, was provided with an armament used exclusively in the Western armies. This armament was simply increased when the enemy's means became greater and more modern.

However, a certain shortage is worth while noticing, because it resulted definitely from a lack of resistance or of organization regarding the weapons; this was especially the case

- of the many swellings of the barrel of rifle Mle 1936 (In 1953 the consumption of barrels of this weapon type was 13,829 as compared with 150,000 weapons used, that is 9.2 %, whereas for the similar weapons the U.S. documents indicate a yearly maintenance rate of 5 %).

The frequency of this swelling near the muzzle might have been increased by insufficient maintenance (presence of mud or earh in the barrel); but beyond doubt the primary cause of these swelling is a lack of resistance of the barrel (it is to be noted that the pressure developed in the rifle 1936 is relatively high, as well as the coefficient of temperature of the powder); the use of a protective plug failed to give the expected result; the shortening of the swollen but unused barrels as practised in Indochina must be considered as no real correction; a remedy should be found in improving the resistance of the barrel.

- Frequent incidents occurred with the machine gun 50 because of a defect in the adjustment of the groove ("feuillure" ?); a better training of the personnel using the weapon would have certainly reduced the frequency of these incidents; yet the use of a weapon should in no case require the preleminary adjustment of the groove to avoid accidents; the design of this weapon should be re-examined on this particular point.

- Frequent ruptures of the cover support of the left leg of the 120 mm mortars were observed even after strengthening the support.

These ruptures do not seem to be due to the firing effects, but rather to the handlings and shocks during transportations (especially harsh unhooking of the telescope and shock on the ground of the telescope and of the muzzle).

Regarding the 120 mm mortars one must mention also the accidents occurring during the operation of the automatic trigger and of the shock absorbing (?) guides, as well as the lack of resistance of the electric welds of the rolling gears.

The main artillery materials used (25 Pdrs., 105 HM.2, 105 HM.2, 155 HM I, 155 GUN M.2) were satisfactory as a rule; some of the difficulties connected with these materials were already observed on the other theaters of operations where they were intensively used under conditions that were not definitely so different. Remarks made on their account should be mentioned here. The following points were noted:

- Lack of resistance, a fact well known no doubt, of the carriage of the 105 HM.2 which renders hazardous the firing of this material with a heavy charge (Charge No 5).

- More rapid wear of the guns 105 HM.2 than anticipated by the American standards; this might be due partly to a lack of maintenance of the weapon, and of cleaning of the projectiles before firing, and also to too high firing rates; it is rather probable, however, that certain pieces of artillery were made by the American Industry with steels of insufficient quality (tearing of the lands between the grooves).

- The deterioration of the carriages (especially in the case of 105 HM.2) which were rapid more particularly in the Vietnamese units; the state of the roads and tracks of the Indochinese theater of operations was a definite cause of rapid wear of the rolling gears; yet the damages incurred by the carriages of the artillery materials are also due to a lack of maintenance especially in the Vietnamese units.

- Many times it would have been advantageous to possess azimuthal material; it frequently happened that the batteries had to prepare opening fire in any direction whatsoever. The performance of such missions would have been much easier if azimuthal materials could have been used.

Some materials were used under conditions which at first appear to be quite illogical; the most typical case is that of the rocket-laucher 2"36; it is an obsolete antitank material whichwas used in infantry combats, whereas it possesses a hollow-charge ammunition whose effectiveness on the personnel stands in no true relationship with its explosive contents. Those who used this weapon liket it only because of its light weight; yet it must be noted that the ammunitions is very heavy when compared with an antipersonnel ammunition of equal performance. The 2"36 weapond poorly suitable for antipersonnel firing should have been used in special cases only, and should have beengradually replaced by a better adapted weapon.

More logically this weapon should have been used occasionally in the attack of small forts against which, however, an explosive ammunition would have been just as effective at least. Yet the consumption of the 2" 36 reached 10.000 per month which indicates a much greater utilization of this weapon than of others.

In fact the special conditions of the Indochinese climate (heat, high humidity) exert no determinant effect on the use of the small and large size armament or on the wear conditions of these materials. The lack of suitability of this material is due especially to the configuration of the ground and to the particular character assumed by the operation in Indochina.

On the other hand the climatic conditions of Indochina exerted a very negative effect on the optical materials (artillery, D.C.A., fortification and general use optics) and on the topographical materials.

The experience acquired in this domain showed that in a tropical climate it is necessary to use materials with impervious optical systems, entirely protected by fungus-destroying coatings. Fixings and adjustments should be sturdy.

No special remarks should be made regarding the behavior of the different types of devices used in Indochina since this is covered more or less by the general observation above. One should however note the lack of resistance of the assembly sockets of the 10x35 binoculars which frequently break during transportations or when the device is being placed on its support. The depth of the upper cut of the assembly socket should be decreased.

The harmful effects of the climate on the maintenance of the optical material requires the organization of air-conditioned repair shops and storing places, and the use in the units of cabinets provided with drying devices.

The effect of the climate on the leather required the abandonment of equipment made with this material. Starting in 1952 the troops of each Arm were to be equipped with materials of the TAP type (cloth). The results were sometimes very poor: rapid deterioration of the cloth, changes of the buckling insufficiently protected from dampness. The problem of the equipment to be used by troops in the tropical zone should be thoroughly re-examined. The protection of the metallic parts should be reinforced; a more resistant material less sensitive to dampness than the material (cloth) now in use should be considered (nylon for instance).

c. DIFFICULTIES ENCOUNTERED IN THE MAINTENANCE OF THE MATERIALS

The maintenance of the material is difficult in Indochina because of the special climatic conditions there, and of the poor circulation due to the type of ground, to the low quality of the road system: damp atmosphere, dusty roads and tracks, frequent crossings of muddy streams, trudgings along in swampy grounds.

The maintenance operations should be carried out more frequently. The allotments of ingredients were quite sufficient, it seemed.

Since the efficiency of the maintenance depended essentially on the knowledge of the material by the users, the diversity of the types of materials used must be regretted, since it rendered the training for the use and maintenance of these materials more difficult and complex.

Users were tempted to neglect the maintenance of obsolete materials and to "break" them/systematically and beyond repair.

d. ORGANIZATION OF THE SUPPLY

The supply problem was greatly complicated by the diversity of the type of weapons used in Indochina.

In addition to the lack of standardization, the use of obsolete materials frequently worn from the start, made it necessary to "live" on reduced, odd supplies. In many cases ineffective solutions were adopted, the parts recovered being always those with the lowest rate of wear.

Finally the replacement of foreign and old materials was difficult because of the lack of proper documentation, the one existing being written in a foreign language and according to old standards.

From this point of view, a modern, abundant and constantly revized documentation is an essential condition for the smooth operation of any supply system. Any logistic organization of a theater of operations risks to be impaired by the lack of documentation corresponding to the conditions explained above.

Regarding the statistic and distributive system of the supplies one must regret that a war time accountancy, similar to that used in France but simplified and adapted, with a recording of the debts, was not used as soon as the war in Indochina assumed the form of a modern war, and important amounts of materials began to arrive in the Far East.

On the other hand since the system of the yearly supply plan requires the anticipation of the needs for a sixteen-month period, dead stocks may have accumulated. The unavoidable errors of evaluation of the normal monthly consumptions were increased by a longer period necessary to renew the supplies. An efficient organization of the now rapid transportations might have greatly reduced the period used for a renewal, and consequently decreased the amount of dead stocks and the frequency of exceptional requests exceeding the supply plan.

This was the orientation adopted in 1954 by the Service as soon as it was placed under the direct supervision of the War Department.

e. DISTRIBUTION OF THE MATERIALS

The distribution of the armament materials in the contact Units (3rd echelon) can be carried out only on a nontechnical basis.

In order to obtain a suitable result and reduce as much as possible the period during which the materials to be repaired was left unused, a serial or "chain" work in the 4th echelon "armament" workshops, as this was done for the automotive materials, had to be organized.

This developed organization of the work was not to the liking of some officers or noncommissioned officers specialized in armament materials; it might have been a lack of imagination or a firmly established routinism on their part; but the tendency had to be contended with.

The fractioning of the repair operations is possible for the armament and for the optical materials; it should produce more efficiency and permit the use of semiskilled labor more easily to recruit.

Table I Features of the small size Armament Park of the F.T.E.O.

a. Categories b. Number of existing materials (service and storage) c. Number of types of materials d. Number and percentage of modern weapons e. Automatic pistol or guns (revolvers) f. Machine-pistols, g. Rifles or carbines h. Lewis guns i. Light machine guns j. Heavy machine guns k. Mortars.

H. AIRBORNE MATERIALS

1. RAW MATERIALS

The following raw materials are used in making airborne materials (personnel parachutes, material containers):

- nylon, rayon, cotton, hemp, paper.

According to the experience acquired in the Indochinese theater of operations, only the materials made of nylon and rayon resisted the tropical climate, especially dampness which causes the development of molds and the

TABLE I

FEATURES OF THE SMALL SIZE ARMAMENT PARK OF THE F.T.E.O.

Categories	Number of Existing Materials (Service and Storage)	Number of Types of Materials	Number and Percentage of Modern Weapons	
Automatic Pistol or Guns (Revolvers)	28.000	36	20.000	71 %
Machine-Pistols	94.000	10	68.000	72%
Rifles or Carbines	400.000	33	229.000	57 %
Lewis Guns	18.000	12	14.000	77 %
Light Machine Guns	14.000	17	13.000	92 %
Heavy Machine Guns	6.000	11	5.200	86 %
Mortars	3.800	16	3.700	97 %

rapid decrease of the fabric resistance, the consequences being

- important repairs in the case of material and personnel parachutes or a lower rating of the personnel parachutes

- the scrapping of the cotton parachutes.

Hence it is necessary to anticipate the exclusive use of nylon in the fabrication of airborne materials (inclusive of straps, bags and threads), whatever the first destination, since the Army supply as a whole is destined for different latitudes.

2. SUPPLIES

The sources of airborne material supplies were

- American surplus purchased in France
- Materials fabricated in France
- Free aid from the U.S.
- Materials purchased in the U.S. through the mission in Washington
- Materials purchased in Japan.

For the personnel parachutes and for the material parachutes we indicate below the percentages of materials delivered to Indochina according to these different sources.

a. Personnel Parachutes

- T.5 and T.7 parachutes from the American surplus : 3.500 sets, that is 18 %

- T.A.P. 660 parachutes from materials fabricated in France 10.300 sets that is 55 % (out of which 2.918 unused sets delivered in June, July).

- T.7 parachutes from the free U.S. aid 5.000 sets that is 27 % (were not used, delivered in April and June 1954)

As a rule the personnel parachute supplies were always suitably delivered.

b. Material Parachutes

	On May 8, 1954	On July 1, 1954
From French Fabrication	20.00 light vehicles that is 17%	20.000 light vehicles that is 9%
From the Free U.S. Aid	67.500 vehicles (out of which 2511 heavy vehicles) that is 54 %	158.000 vehicles (out of which 5159 heavy vehicles) that is 69 %
From purchases in US	20.000 light vehicles that is 17 %	23.000 light vehicles that is 10 %
From purchases in Japan	15.500 light vehicles that is 12 %	29.000 light vehicles that is 12 %

Contrary to what was said about the personnel parachutes, difficulties arose late in 1952 and early in 1954 regarding the supplies of jettisoning materials.

Late in 1952 temporarily insufficient supplies were rapidly compensated by the U.S. delivery of light vehicles for materials and by more rapid deliveries from France.

The rate of the supply operations by air, late in 1953 and during the first half-year of 1954 exceeded all previous anticipations. The jettisoning material supply program, whose execution by France had been delayed considerably (*)was on that account insufficient and poorly adapted to the needs (total lack of heavy jettisoning materials) (* In January 1954, France had still to deliver, on the basis of plan 53:

- personnel parachutes: 3.700 sets (total 1953-order)
- material parachutes: 102.000 light vehicles (out of 102.282 recorded on the PA 53).

Only a considerable assitance lent in this domain by the U.S. made it possible to secure during this period the air supply of the entranched camp of Dien Bien Phu and of the other resistance centers of the Tonkin Delta; of Central Vietnam and of Laos; the supply consisted mainly of

- 65.000 light canvasses
- 2.000 heavy canvasses (exclusive of the elements of the two 105 groups)
- two 106 HM2 groups

These materials were directed toward Indochina to a small extent from the U.S., and for the most part from Japan where the materials indicated below were stored for the Expeditionary Force:

- 37.000 light canvasses
- 2.500 heavy canvasses.

In order to be used eventually as a basis for later evaluations, we indicate below:

- the amounts in tons of materials jettisoned between November 1953 and the end of the hostilities;
- the amounts of parachutes of the different categories to secure the jettisoning of these materials;
- the amounts of material parachutes used in supplying the entranched camp of Dien Bien Phu and which were not recovered.

Amounts jettisoned from November 20 to May 8, 1954 - 20.600 T

- Small canvasses (G.1 - AMR - F.C. 100 - PPC 110) 105.000
- Large canvasses (G. 12 - G. 11) 3.500

Number of Unrecovered Canvasses

- Small canvasses 63.000
- Large canvasses 850

During this period, the supply of certain secondary jettisoning materials raised difficult problems because of their consuption reaching a very high level.

For instance the consumption of tying ropes, 950 kg daily on an average in 1953, was 2.600 tons during the first half of 1954 and, during the especially active period of April 1954, was as much as 7 T daily.

In order to provide a sufficient supply of these secondary materials, the local sources, accelerated supplies from France and the U.S., and purchases in the Philippine Islands and in Japan were used.

(200 tons of tying ropes from the Philippines
(200 tons of tying ropes from Japan)

The diagrams enclosed describe with precision the conditions under which the deliveries of material parachutes were carried out from July 1953 to July 1954

- Diagram I: light canvasses
- Diagram II: heavy canvasses

3. STORAGE

In a tropical climate the storage problem is capital.

In the case of the definitive sorage one must make a maximum use of air conditioned locals (60 % humidity - 25 centigrades); if such locals

do not exist it is necessary to observe strictly the regulations concerning the maintenance, especially as regards the periodical aeration of the canvasses (every other month for the personnel parachutes).

These maintenance operations require much labor and the use of large aeration halls.

Thus finally it is more advantageous to keep the materials in air-conditioned locals, and consequently to make the necessary installations rather than to have to secure a continuous maintenance of the parachute supplies.

Another problem in this domain is the temporary storage of the recovered materials; as a rule, these materials were not suitably handled during the Indochinese campaign because especially of the lack of necessary means.

The storage of the recovered materials to be evacuated to the rear bases is possible normally only if a specialized personnel is available and equipped with suitable materials such as

- drying tents
- storage tents
- parachutable folding tables, etc..

These materials existe but their utilization did not apparently exceed the experimental stage.

4. SALVAGE

The airborne materials (parachutes, containers, secondary materials, are expensive, rare and fragile.

Their recovery under optimum conditions must be sought by all means possible; it was especially difficult during the Indochina operations, particularly because of the uneasy connections with the places to be provided with supplies (often consisting in isolated places in the enemy zone), and because of the lack of suitable means of transportation; the authority responsible to solve these difficult problems had to use any means available at the time; in many cases, however, materials were lost or had to be scrapped for want of immediate recovery.

An efficient recovery of the material parachutes and of their accessories can be carried out only if a parachutist personnel with a special infrastructure is available and eqpuipped with suitable working materials and means of transportation (aircraft, helicopters). This recovery requires the assistance on the part of the troops for which the jettisoning operations are performed; yet the technical responsibility for the recovery operations devolves with the Material Service.

In France two parachutable sections exist for each maintenance and folding company; the mission of these Units equipped with light transportation means (small trucks) is to secure the recollection of the parachutes. Orders were given in July for the formation in Indochina of recovery teams; six teams were to be provided by the air delivery Companies while waiting the formation of teams by the Material Service. This was the beginning of an organization which was intended to improve to a certain extent the recovery of the airborne materials.

During certain operations many personnel and material parachutes were rendered unusable by the combating elements who cut off spindles, pannels, suspending ropes often for vain purposes (souvenirs, scarfs, shoelaces, etc..).

The value of the material should be taught to each combatant, and suitable measures should be taken to prevent misappropriation of materials whatever its state may be.

5. REPAIR

The repair of airborne materials was performed until the end of hostilities by two workshops, one in Hanoi and the other in Saigon; these workshops were suitably equipped and performed a satisfactory work until late in 1953.

The sudden increase of the rate of supply air operations all over the Indochinese Territory during the first half of 1954 imposed an excess of work in these workshops beyond their capacity. In order to correct this situation, the Material Service requested an increase of the potential of these two workshops, and the creation of a 3rd workshop at Tourane.

The situation could have been improved less expensively and more efficiently if means had existed for the formation of light repair workshops.

These mobile workshops equipped with trailers and whose organization was studied in France would have taken care of the minor repairs (darnings, patchings); the materials involved would have not been tied up so long by far, and the materials requiring important repairs would have been directed to the 3rd and 4th echelon workshops, which then would have able to suffice for this purpose.

Finally such an organization would have reduced the volume of materials under maintenance conditions.

F. AMMUNITIONS

Previously, in Chapter II, Paragraph C, we examined the problems of supply and storage of ammunitions. These problems never ceased to increase during the campaign.

We shall study now the difficulties raised by the storage of ammunitions, their transportation and their use (systematic defficiency).

AMMUNITION STORAGE

The harmful influence of the tropical climate on the storage of the ammunitions is well known; it is mainly the consequence of a high hygrometric condition and of frequently important temperature variations which cause an accelerated aging of the powders.

The climatic conditions are not absolutely uniform over the entire Indochinese territory; one can admit nevertheless that the existing conditions are not sufficiently important to distinguish between the storage conditions from one point to another.

The first condition to fulfill in order to secure a satisfactory storage of the ammunitions in a tropical climate is to obtain impervious packings for all types of ammunitions.

On the other hand optimum precautions must be taken in organizing the stocks. Each time when permited by the material and by the financial resources, wharehouses of the colonial type must be set up since they offer excellent storage conditions. It is not always necessary to construct entirely closed shelters, but then one must secure the protection of the ammunitions against the weather variations, especially against the heavy rains of the wet

season; the following precautions should be taken:

- Upper protection by means of a sheet-metal cover (*) which in certain cases can be arranged simply on boxes (* In certain regions and for temporary storages the sheet-metal cover can be replaced by latania leaves fixed on bamboo canes. This is economical, rapid and effective).

- Raising the packing from 1- to 15 cm above the ground by means of cement sands or other salvage material, such as empty metallic containers 75 or 105, except wood which permits termites to have access to the ammunitions boxes.

- This raising permits a satisfactory aeration of the stocks, makes water evacuation possible during heavy rains and opposes an obstacle to termites.

TRANSPORTATION, BOXING, MARKING

In order to facilitate the supplying operations and the use of the ammunitions, all the ammunitions must be parachutable, packed in complete sets; the packing must be organized in such way that no preparation is necessary before parachuting.

The parachuting of ammunitions in Indochina required the local fabrication of different accessories: boards, assembling rods, clips, etc...; this fabrication was a heavy imposition on the Material Service especially at the time of the Dien-Bien-Phu battle. A suitable packing might have avoided this trouble.

On the battlefield the transportation of the ammunitions by the combatant, especially of the complete sets for mortars would be much easier,

were the ammunitions grouped in burdens provided with a strap system with a handle. This system used abroad (English 2 and 3" ammunitions) has just been adopted for the STRIM 32 XO grenades; this use should be extended to all Units.

The marking of the French ammunitions is frequently deffective. For instance the 20 grenade box has the markings on the lid. Bad weather and handlings render these markings illegible. Only the transfer number on the sides of the boxes remain.

One should adopt

- either the U.S. data card system
- or the German system: a label fixed inside the box with complete information concerning the ammunitions and the contents.

The many handlings to which the ammunitions are subjected involve the deterioration of a certain percentage of packings; a special workshop to remedy this situation must be established in each combat zone; this workshop must also be organized in order to prepare the firing wastes for their shipment.

SPECIAL FEATURES CONCERNING THE USE OF AMMUNITIONS - DEFFICIENCIES

The difficulties involved by certain ammunitions used during the Indochina was are due either to the poor adaptation of the ammunitions to the special conditions of this was, or to defect of the ammunitions themselves.

The main observations made during the operations and concerning the different types of ammunitions are given here:

- The American rockets M.53 involving a 0.05 second delay action and used in priming projectiles of mortars 60 and 81 cause a high percentage of misfires. Their use should be proscribed.

- The RYG 18 (C.R.) rockets proved to be unusable in Indochina because the artillery fires are often performed on swampy grounds (ricefields); in most cases the rockets of this type delivered to the Units were returned.

- The American rockets (D.E) M. 54 with board (maximum duration of operation: 25 seconds), whose replacement by the M.500 rockets is very advantageous, became rapidly unusable because of the alteration of the powder. This alteration was already noted on the European theaters of operations. The tropical climate simply accelerated this process.

- The American percussion rockets M.51 A.5, which start most explosive artillery shells (105, 155) caused many untimely explosions especially with the 105 H.M. 2 materials, that is 25 out of 1.800.000 fired shots approximately. An untimely explosion was observed also in the case of a 155 H.M. 1 during firing. The cause of these premature explosions was not determined with certainly; probably most of these explosions were due to a premature operation os the "Delay" system of the rocket.

- The use of the 102-H.M. 2 cartridges with French Mle-1935 explosive shells raised many difficulties: uneasy introduction of the cartridge because of an insufficient chamfer of the belt, irregularities in the bearing, projection of metal base splinters up to 1.000 meters ahead of the explosion point, etc.. The studies conducted in Indochina to determine the causes of the bearing irregularities and of the projections of metal base splinters gave no results; the study of this problem was proposed to the Technical Section of the Army. Late in 1953 the use of these cartridges was forbidden on the theater of operations; they are now used for training purpose only.

- In 1953, the use of the 105-H.M2 smoke shells with hexachlorethane (HC M.84), and of the mortar smoke-shells was forbidden in order to prevent the enemy to use the projectile bodies, still untouched after firing, as traps.

- The question of the use of the Pozit rockets in Indochina gave rise tomuch controversing. In 1952 the trend was not to use this priming type; on the other hand towar the half of 1953 and in 1954 the Pozit rockets were requested by the Artillery.

- The Armored Arm made an intensive use of the 37-gun "canisters" in close defense operations, and to clear road approaches. A similar type of ammunitions would have been desirable for all the armored vehicle materials or even for the artillery materials, because its efficiency in close defense operations is considerable. Requests for canisters to be used with the tank-75's were placed, but no canisters were received in Indochina.

- The English grenades, especially the M. 74 antitank grenades and the Mills are not liked by the combatants, mainly because the rapid deterioration of the priming devices make their use unsafe. This process is not peculiar to the grenades priming devices. Serious difficulties were caused by the English rockets also because of the deterioration of metal elements in light alloy. The alteration of these elements was observed on the theaters of European operations; it occurred more rapidly in Indochina because of its climate. Serious accidents were caused especially by the M.119 rockets used in starting the 25-PDRS explosive shells. As a result of these accidents an important amount of shells primed with the 119 rocket (26.000) were destroyed. Since early in 1954 all the deliveries of 25-PDRS ammunitions were requested with 117-rockets; the experience acquired in Indochina with this type of rocket,

however, is not sufficient to permit an opinion concerning its value.

- The antipersonnel 32-XO grenades at first were the object of a pre-serial request by the F.O.M. for 10.000 grenades to be used in a tactical test in Indochina. Before this test was conducted, and taking into account the results of the tests carried out in France, new requests were made. The fabrication was gradually improved as a function of the test results.

Early in 1954, the 32-XO grenades were subjected to testing in three battalions in North Vietnam. In May five soldiers were killed and twenty wounded by two accidents in these units. These accidents seemed to be caused by grenades whose piston protruding beyond the bottom of the vanes would have been held on the barrel of the gun; under the effect of the weight of the grenade, the pressure exerted by the extremity of the barrel on the piston of the rocket caused a cutting of the fuse safety pin and later on the rocket started under the effect of a shock.

After these accidents, the following measures were taken:

- The use of any 32-XO grenades esisting in Indochina was interdicted
- Shipments from France were suspended.

The following stocks existed at that time in the supplies in Indochina:

- Grenades exhibiting a design defect (unthickened bottom of vanes, and consequent protruding of the piston) and possessing a safety pin insufficient for parachuting operations.

These grenades were destroyed (105.000).

- Grenades which were improved (thickening of the bottom of the vanes) but cannot be parachuted (insufficient resistance of the fuse safety-pin). The use of these grenades was temporarily interdicted. There are 94.000 stored at the E.R.G. MU of Saigon.

Tests are now being performed in Indochina (STM) in order especially to determine the guarantees of safety offered by the latter grenades and in order to define their conditions of application.

The 32 KO grenades which now are fabricated are supposed to be provided with a reinforced pin.

CHAPTER IV

TECHNICAL PROBLEMS INVOLVED IN THE ADAPTATION OF THE MATERIALS TO THE WAR CONDITIONS

I. PRELIMINARY REMARKS

The form of the combats in Indochina changed constantly since the police operation was conducted against the guerillas until a was of attrition was obtained; this change occurred simultaneously in time and space.

Armament and material had to be adapted as much as possible to the forms of battles to be fought, yet other factors influenced their change first of all the nature and the volume of the supplies received from abroad.

Let us remark that between the moment when the wish for some change of this type was concretely expressed by the troops in contact, and the moment when the corresponding material was modified or changed, a rather long delay would elapse, that is up to two years sometimes. Under these conditions, when the material was ready for delivery, the combat circumstances might have well been deeply modified so that the material sent no longer corresponded to any need.

II. MODIFICATIONS OF CERTAIN MATERIALS

A very large number of modifications of materials was requested during the eight years of war in Indochina; some of these modifications were performed directly by the users most times without the approval of the commanding officer, which increase the difficulties involved in repairing and replacing the unduly modified materials.

The main modifications must be classified in several groups:

- those whose purpose was to protect the transported personnel
  - armoring of the road vehicles, river appliances, railroad cars
  - overarmoring of floors of armored appliances
  - antimine carpets
  - antigrenade roof
- those whose purpose was a rapid preparation for use of the transported armament, that is many weapon stands, platforms for road vehicles, railroad cars or river appliances;
- those to facilitate the equipment of fortified structures,
- those concerning the road vehicles;
- those for the gransformation of the road vehicles into railroad cars;
- those connected with none of these groups.

A. Modifications of Vehicles for the Protection of the Personnel

The mainpurpose of these modifications was totransform the road vehicles into temporary or makeshift armored vehicles; they were performed at the beginning of the campaign when the absence of armored vehicles constituted a drawback for the Expeditionary Force.

a. Armoring Road Vehicles

The main vehicles which were armored were jeeps, 6x6 Dodges, G.M.C., Canada Dodge trucks, 3 T-Ford Lorries. Because of the inconvenience due to the increase of weight of the vehicles, these materials were rapidly abandoned, except the G.M.C. armored and equipped with an antiaircraft 40-gun still used to a small extent in South Vietnam.

b. Armoring Amphibious Vehicles

From the increase in weight point of view, armoring gives still worse results when applied to amphibious appliances. No armoring was possible especially with the cargo-carrier model 29 C, the so-called "crab". On the other hand the landing vehicles tracked model 4, the so-called "Alligator" stood a slight overarmoring of its sides, although some of its moving ability was lost.

c. Overarmoring of Floor of Armored Vehicles

At the beginning of the mine war, when the mines used were not powerful, the overarmoring of the floors of the light armored cars model 8, of the Coventry light armored cars and of the Humber I and II scout cars proved to be effective; this was no longer the case when the charges used were powerful enough to turn over the attacked vehicles. Thus in this particular case of floor overarmoring, the time factor played a primary part.

d. Difficulties of Execution

At the times when these armoring works were requested the French Iron and Steel industry needed long production delays; hence the armoring works reached Indochina long after the requests; in the meantime the needs had changed and the greatest part was not used.

Difficulties were encountered in the use of the armoring metal sheets; especially their cutting with a blowpipe modified the texture of the metal and left abnormal strains; many plates became ruptured once they were placed, especially on the L.V.T.4 and on the light armored cars M.8. The fissure as a rule would run along the cut edge, at a 4 or 5 cm distance.

e. Antigrenade Roof

Such an arrangement was mounted first on the Half-Trucks in the form of a roof-shaped metallic grating. Soon after, the rebels used hook-grenades, so that the grating had to be replaced by a light metal-sheet. This system was extended to the scout cars and to the turret of the light armored car model 8.

f. Antimine Carpets

Nearly all the general use vehicles were gradually provided with antimine carpets consisting of a thick layer of vulcanized rubber. To make it more efficient, rubber rolls filled with sand were placed under the carpet. Only the driver cabin was equipped although the Medical Service requested the extension of this equipment to the body for all personnel-transportation vehicles. The sole combat vehicle which was equipped with a carpet of this type was the Half-Truck model 5-A.1 (driver cabin and box).

B. Weapon Stands and Platforms

Many weapon stands had to be fabricated in order to equip ordinary vehicles or combat vehicles, and river vedette-boats. Other stands were modified so as to be used with weapons for which they had not been designed.

The main vehicles which were equipped were:

- Jeep, Dodge 4x4 and 6x6, G.M.C.
- Scout-car, Half-Truck, Brenn carrier, light armored car, M.8, M.20 and Panhard 178-B, tank destroyer M-36, B.2, Crab alligator
- Armored railroad cars
- Vedette-boats (8 and 11 m)

The main weapons which were used were:

- Lewis guns model 1924-29, Brenn and Bar;
- Machine gun model 1931 (7.62 mm and 12.7 mm)
- Grenade launchers,
- Mortars (60 mm, 3", 81 mm, 120 mm)
- Guns (57 mm, 75mm recoilles),
- Guns 40 Bofors,
- Guns (47 mm) model 1937,
- Flame projectors M.2-A.1

Most possible combinations were obtained after long and complex studies. They coincided with the best use at a given time of the available materials. Seen in the proper perspective they seem to be very unsystematic. What was needed was a comprehensive program based on sensible anticipations and established by the Headquarters, then carried out by the Material Service.

C. Armament of the Fortified Structures

In this case also every means available had to be used, turrest of armored appliances especially (light armored cars M.8 and Panhards; Panther, Centaur and Crusador tanks), scrapped of withdrawn from use after being replaced by more modern or better adapted appliances, were gradually utilized. Sometimes only the weapon of these turrets was used (37 mm S. A. model 1938 and 37 mm model 3).

Certain automatic weapon stands for vehicles were placed in front of the battlements of the fortified works.

Finally azimuthal platforms designed first for the 60 and 81 mm mortars on the vehicles were adapted to defense works; the system was extended to the 120 mm mortar.

D. Modifications for Road Vehicles

a. Adaptation of Trailers

Some French CODER semitrailers had to be modified so as to be used with American tractors.

In the same way some Lagache 8 T semitrailers are being modified in order to be used with Renault tractors.

Two Canadian Dodge frames were transformed into trailers with one 2 T axle; one Half-Truck axle was transformed into a carterpillar trailer for the transportation of boats on very poor roads.

b. Water Tanks

There was a shortage of water tanks during 1952 and 1953 before the shipment of the Blereau Lebel tanks. Hence some 1/4 T trailers were transformed into water tanks.

Twenty G.C trucks provided with gasoline tanks were supposed also to be transformed into water tanks. This transformation was applied to one of them, but the operation was stopped because of the difficulties of painting hard-to-reach recesses. Only a brush was used because of the fog produced by the spray gun in the tank. Several layers of paint were necessary; the drying operation was carefully conducted. From the water conservation point of view the result was excellent; after several days in the tank the water was found to be very good, odorless and tasteless by the Army Laboratory.

c. Repair Devices

The light armored car squadrons requested the allowance of a carterpillar repair appliance; thus lots 7 were mounted on Half-Trucks; these materials seem to have proved satisfactory, yet a 4 T Wrecker might have been more advantageous; the number of these vehicles was too low.

The amphibious squadrons needed some repair appliance suitable for the ground on which they usually operated; the appliance had to be amphibious. Several more or less successful tests were conducted . The problem seem to be acceptably solved by a combination of a L.V.T. provided with a winch and of a L.V.T. equipped with booms (jibs?) of a 4 T Wrecker. The L.V.T. which is most easily equipped with a winch is the L.V.T. (A) 4 once the turret has been eliminated. A vehicle of this type is being arranged for this purpose.

d. Miscellaneous

Many light armored cars M.8 were equipped with a system permitting the turret gunner to produce reverse motion; this is obtained by means of a steering wheel controlled by chain drive the direction of the vehicle. This rough equipment requires a double drive on appliances of this type.

It became necessary to ventilate the control cabin of the L.V.T.4 near the engine because of the high temperature involved.

A "crab" was transformed into an ambulance vehicle.

e. Transformation of Road Vehicles into Railroad Cars

Because it was felt necessary since the beginning of the campaign too keep a watch on the railroads between the runnings of trains, certain road vehicles (Jeep, GMC and Brenn Carrier) were adapted to the metric railroad traffic. The resetting of the vehicles at the end of the run had to be provided for. In the case of the Jeeps this result was obtained either by means of a lifting jack under the vehicle, or by means of two Jeeps connected together in the rear, only one driving at a time in the respective direction.

The fabrication of the wheels raised a difficulty: since the first wheels were designed with a cylindrical tire, the vehicles were soon set in a dangerous swaying motion and the flanges became rapidly worn; the classical conical tire had to be used.

The section had to be firmly blocked.

f. Pack Transportation

It was felt necessary to use pack transportation in the case of difficult or roadless regions. Different existing packsaddleswere adapted to the carrying of different materials:

- packsaddle models 1876, 1930 and Schneider packsaddles
- 75 mm S.R. gun model 20; 81 mm mortar of 4.2" (106.7 mm) model 30, and 120 mm model 1949.

g. Miscellaneous

For their night operations certain armored vehicles were privided with adjustable headlights, directly in the troop formations, often without the authorization of the commanding officers or in technical accordance with the Material Service.

On the other hand the Material Service had equipped a light armored car with infrared rays devices:

- driving system for night operations;
- scouting device and sighting telescope.

Some Mauser rifles (7.92 mm) were equipped with Japan-made sighting telescopes, to be used by crack marksmen.

The 25 pound guns (3.45" or 87.7 mm) do not use any overload in Indochina; it was decided to eliminate the muzzle brake on the materials where it involved dangerous deterioration. At the same time one must eliminate the balance mass bolted near the breech.

III. LOCAL FABRICATIONS

They were not many and involved secondary articles; but it only reveals the relative inefficiency of the industrial means of the Material Service.

a. Proton Packsaddles

Captain Proton, a veterinarian, invented a light packsaddle made of steel tubes; he called it the orthopedic packsaddle. Five packsaddle of this type were made to be used on mules; 50 were made to be loaded on poneys.

b. Floatable Equipment

Because of the abundance of water in the Delta regions it was felt necessary to provide the combatants, for certain operations, with a system that would allow them to float with their equipment. This was the origin of the "B.I. B.54" (bivalvular infantry buoy) made in 3.000 specimens by a civilian plant of Saigon.

c. Grenade Launchers

It is one of the most important products made by the Material Service. It consists of a breech box and of the chamber of a Mle 1936 gun emerging in a capacity (?) on which two or four gun ends of the same type are fixed. This appliance was fabricated in large amount and used especially in arming fortified works and certain armored vehicles; it permited the simultaneous

launching of two or four grenades of rigle model 1948. It was easy to adapt it to the firing of 32X grenades. It was valued by the troops which used it.

d. Chemical Igniter

During 1951 containers of jellified incendiary liquid, makeshifts released at a low altigudes, were used by transport aircrafts. The Material Service provided these containers with chemical igniters locally fabricated by means of a lead tube containing a small glass flask filled with sulfuric acid and a small amount of potassium chlorate.

e. Pyrotechnical Releaser for Parachute

During the Dien Bien Phu battle it was felt necessary to perform parachute operations from an altitude not lower than 3.000 m above the garrison. The Material Service immediately developed a very simple pyrotechnical releaser consisting of an igniter, of a slow fuse of a definite length, starting a detonator which would tear off the straps preventing the operation of the parachute.

The device was fastened in a cardboard envelope used for recovery (American packing).

A makeshift igniter was made with the help of a match paste cast into a cartridge case; ignition is obtained by pulling a small string coated with a phosphorous paste and running through the fuse composition.

f. Mytho Boat

In 1953 the Material Service developed a wooden boat driven by a motor and a Jeep transmission whose transport capacity is two tons at a 6 knot velocity. Made in several hundreds of specimens, this boat renders very valuable services. The Material Service designed and cast propellers.

IV. CONCLUSION

Under the pressure of the military events many efforts were made in order to adapt as best as possible the vehicles and armament on hand. The results obtained are those from unsatisfactory tinkering jobs. No doubt this survey shows that this campaign would had been more effective, had it been subjected to a close study and thorough preparation. It would then had been possible to develop and fabricate on an industrial basis the material necessary for the missions to be carried out by the troops. France, however, who was recovering with difficulty from World War II, could not think of undertaking this enterprise. Frequently the Headquarters had to resolve the problems of the materials on the basis of what was available at the time without being able to take into account the technical factors.

CHAPTER V

SPECIAL TECHNICAL FEATURES OF THE MINE AND TRAP WAR

Mines and traps were abundantly used during the campaign in Indochina on both sides. However, considering the type of combat fought, the Franco-Vietnamese troops experimented all the disadvantages involved without deriving the benefit expected.

In order to consider the total mine and trap question from the technical point of view, one should examine:

- the models of mines used by the troops on our side
- the ways in which these models were used
- the Viet-Minh devices and their use
- the processes and means of detection of the mines and the mine clearance methods.

I. MINES AND TRAPS USED BY THE TROOPS ON OUR SIDE

The mines used by the Franco-Vietnamese troops were

- English antitank or antipersonnel Hawkins 75 Mark I mines
- American antipersonnel M 3 mines
- American bounding antipersonnel MA-A1 and M2-A3 B2 mines
- American antitank M-A1 and M4 mines
- French undetectable antipersonnel (A.P.I.D.) Mle 1948 mines
- American antipersonnel NM 14 mines.

The Hawkins mines do not store well in the tropical climate and had to be destroyed late in 1952 after one year in Indochina.

Among all the other models of mines, the most efficient and apparently the most valued were the bounding M 2 A1 and M A 3 B 2 mines.

For want of mines of this type great use was made of the U.S. antipersonnel MM 14 mines which were not cumbersome, were light and stored well. One of these mines however seems to be efficient only against the man who determines its operation.

The U.S. antitank mines were not used very much because the enemy did not have heavy vehicles at his disposal.

As for the French A.P.I D. Mle 1948 mines their fragility was so high that many of them arrived ruptured to France. Others became ruptured during handling and most of them had to be destroyed. The bodies of some which were laid became deformed even in dry ground and finally opened. Their charge made of schneiderite would become impregnated with water and could not detonate. The Military Affair Department and the Army Technical Section were informed of these facts by the reports of the different Ammunitions Services and by the Inspectors . The Army Technical Service conducted new tests on these mines and concluded that the A.P.I.D. MLE 1938 mine was not a material possessing the required operational qualities (1. Letter No 9483/L of the STA of November 20, 1953 annexed to the technical Note of same reference of November 19, 1953).

In addition to these different types of mines used, Indochina received French A.P.I.D. Mle 51 mines which never went beyond the experimental stage because of the poor results obtained by the Material Technical Section. The first mines charged with schneiderite stored poorly. At the present time the new mine bodies are satisfactory by not the igniters.

On the other hand on their own initiative the combatant often tried to modify the explosive ammunitions in order to transform them into mines or traps and serious accidents resulted. A proposal was made in order to re-use as mines the unexploded shell (3* Proposal of the Commando Group No 6

transmited under No 350.MU/MA.6 of March 19, 1953 of the DIRMAT/FTSV). These transformation methods became the objects of several reminders to interdict them.

However, because of the shortage of antipersonnel mines, the SIM in 1950 studied the production of traps on the basis of grenades of German 50.3 mm rifles unsuitable for firing (4* Study requested by Note No 341 /FABO/3.S of March 15, 1950 and the Chief Commander, and letter No 1076 /ZOT/3.S of March 6, 1950). A certain number of appliances used by the Units proved satisfactory.

The troops on our side often used, along with mines, illuminating traps whose purpose was to give the alarm to the garrisons of the posts: illuminating Ruggieri mines or Flare trip T 6. The Ground Forces of South Vietnam had proposed also the use of sounding traps in which the percussion of a cartridge should have given the alarm (5* Study requested to the S.T.M. by Note No k2k8/EMIFT/3/SC of July 29, 1952). All these traps were able to operate where an animal would pass by; they did not give the expected results especially because of their poor storage ability.

II METHODS APPLIED BY THE TROOPS ON OUR SIDE TO THE USE OF THE MINES AND TRAPS

The mines, provides with a trap or not, were used by the troops on our side

- especially in establishing mine-fields around the posts
- secondarily by patrols in their effort to intercept an enemy route.

The laying of minefields was a time-consuming operation. Because of the presence of civilian population, places where mines had been laid had to be marked by panels and wires which also indicated their presence to the enemy. The enemy any way had observes at his disposal, who would be present when the mines were being laid. Thus perfectly informed, the enemy was often able to steal the devices or to displace them in order to raise difficulties for our patrols.

The posts were organized for a long time. The mines used to protect them had to remain long in the ground and were subjected to very difficult conditions. The garrisons of the posts would be replaced by the relieving elements; these new elements might sometimes modify the arrangement of the minefield without rectifying the plans, hence many losses on our sides by our own mines.

On the other handm the mine fields were rapidly invaded by casual vegetation whose rapid growth was an obstacle to the sighting and the target ranges. It would have been necessary to remove the vegetation from the mine fields and from the wire entagnements; but this would have been a very difficult operation. In some cases weed-removing products were used; but it was not possible to generalize the use of these products.

In the sandy grounds the mines were often unearthed by the tropical rains and would become very visible. Thest revealed that it was possible for the small MM 14 or APID 51 mines to be tilted or displaced by the water of rains. These facts were still more troublesome in periodically flooded areas.

Certain posts possessed, in addition to mines, flat antipersonnel 20 kg-charges with electric ignition. These charges were placed when the accessory defenses were installed and were subjected to the same weather effects as the mines and would not store better. During a thunderstorm it happened that several charges operated spontaneously and at the same time. (* Report of the 1st Company of the 6th R.T.A., transmitted to the S.T.M. in Memorandum No 1052/FTNV/3.I. of the Headquarters of the North Vietnam Ground Forces on May 30, 1952).

In the offensive action our troops were able to use the mines only under certain circumstances in order to intercept an already known route of the enemy. Since the enemy element, however, was usually preceded by isolated scouts, it would rarely incurr serious damages by the mines placed along the route. Even remote-control devices would make only one or two casualties in a group. In order to obtain better results, some South Vietnam Units replaced the use of the mines in the missions by the use of flat antipersonnel 10 kg-charges. This device correctly used seems to give better results.

III. VIET-MINH DEVICES AND THEIR USE BY THE ENEMY

The enemy possessed

- locally fabricated antipersonnel or antivehicle devices,
- devices provided with the Chinese air or obtained from friendly troops.

Most of the locally designed mines were made by nontechnical producers and thus differed very much in their fabrication according to the imagination of each designer. The bodies were made of cast iron, steel sheet, bamboo, cement, glass or tin plate. The charges consisted of rine black powder,

melinite or talite. Most of the antivehicle mines used during the last years of the campaign had a hollow charge with a copper coating. Operation was secured by mechanical igniters started by pressure or pull, or by electrically started igniters.

The description of those different devices made the object of study cards established by the Material Techical Section (a part of which was published in the Note of Information No 4 of the EMIFT/2nd Bureau of the Material Technical Section concerning the Armament and the Ammunitions of the Viet-Minh), and a "manual" of mines and traps in the Far East (published by the Engineer Command of the F.T.E.O. in 1950).

Since rather elementary fabrication methods were used, these mines did not always store well although their makers were careful to coat the different seams of joints with resin or tar.

The devices provides by the foreign help or obtained from friendly troops were of known types: Russian types TMD-B, Japanese type 93 Mle 1959 (the latter modelwas rather rare).

Despite all the diversity involved, the enemy's mines did not offer anything in their conception that would deserve our interest.

On the other hand their method of use should retain out attention. Unlike the troops on our side, the Viet-Minh used the mines during offensive action inside our disposition. More rarely he used them todefend fortified villages. In this last case he would combine them with traps.

The friendly elements depended on the rare road axes or their displacements and supplies. These obligatory thoroughfares were excellent points where to lay mines which were powerful as a rule. These mines would be placed at

the last moment, sometimes they were pushed under the wheels of a vehicle by means of a bamboo cane and would not stay a long time in the ground. Hence they did not have to be very tight. Oftentimes, provided with remote control either by pulling a wire or by electrical means, these means were safe enough so as to permit the gunner to pick them up of unused.

On roads full of pot-holes that sometimes were filled up with made ground it was easy to camouflage mines. Many times the Viet-Minh would bore a drain in the embankment of the roads and would thrust mines below the roadway. Thus no traces would reveal the presence of a mine.

The casualties caused by this method of using mines were very heavy. It also constituted a constant threat for the total road network. Considerable effectives had to be immobilized in order to hinder the enemy in his laying of devices and to detect these devices.

Hence mine clearance became an acute problem.

In trying to destroy our roads, the enemy used submarine mines for the destruction of bridges. In this domain the Viet-Minh, it seems, was aware of the ultramodern methods developed by the Germans during World War II (1939-45) but not yet applied (* Use of submarine mines in the case of the bridge of Binh-Loi, S.V.N. on July 23, 1954). The mines would be brought to the right place by swimmers who would immerge the devices from the shore, often at a distance of several hundred meters from the fastening point anticipated. Hidden under masses of water plants, the swimmers would lead the mines to the selected point after a careful study of the place.

IV. METHODS AND MEANS USED IN MINE DETECTION AND MINE CLEARANCE

To clear the roads from the mines laid during the night road-opening patrols had to be sent each morning by the posts.

After much fatigue and time-consuming work, finally the scouts would be able to detect the places where mines had been laid recently. They might possess electromagnetic detectors requiring a long operation and much personnel. However, certain nondetectable mines, or others laid in a chamber opened in the road embankment, would baffle any investigation.

In an effort to correct this situation, the 13th Half-Brigade of the Foreign Legion had proposed a project concerning a roller platform which, pushed forward by a vehicle, would cause the mines to explode. The Material Technical Section to which the proposal had been referred, ordered two models of the platform to be designed (Letter No 140/BT of May 1949 of the Technical Bureau of the Material Command of the F.T.E.O.). The results obtained, however, were not satisfactory. In the same way railroad cars were placed in front the locomotives to cause the mines to explode; but the enemy designed mines subjected to remote control by the head car, and exploding under the locomotive.

At the present time we must acknowledge that there is no sure prevention against the mines used in offensive action.

V. CONCLUSIONS

Beside the difficulties involved in the laying of mines and the necessity to draw plans, the use of mines in defense and stabilized positions implies:

- perfect imperviousness of the mine bodies and of the igniters

- a safety device of easy operation, even on a laid mine, in order to permit the raising of the appliances when the elimination or modification of a mine field is desired.

On the other hand the use of mines in offensive action in the areas behing the enemy is much more flexible. In this case the appliances used do not have to resist a long time to the effects of the weather. Although the operation of the mine is not safe, the mine remains a serious threat against the enemy, who then has to take quite a number of precautions which heavily increase his obligations and paralize his displacements. In the unsafety zone, where scattered enemy elements or active (5th column, parachutists) the remote control mines used by them are especially efficient and in this case no preventing is effective.

Thus the investigation of new processes for the detecting or clearance of mines must be pursued despite the difficulty raised by the solution of this problem.

ANNEX I

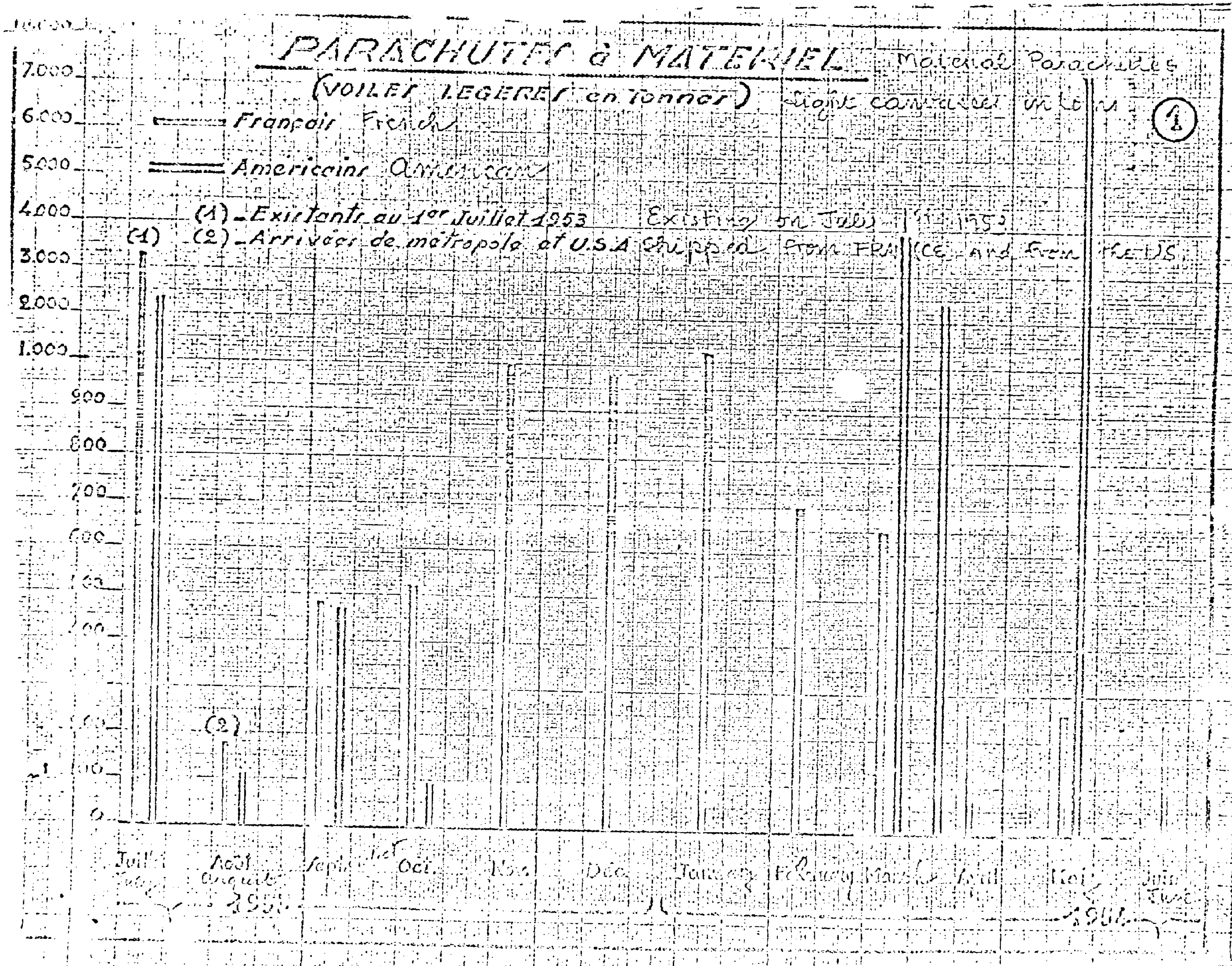
REPORT OF THE CHIEF OF THE AIRBORN TECHNICAL SECTION OF INDOCHINA CONCERNING THE LESSONS TO BE LEARNT FROM THE OPERATIONS, AND RELATIVE TO THE AIRBORNE MATERIALS

The materials used by the airborn troops belong to the Air Force and to the Ground Force.

The lessons to be learnt have been classified approximately in the chronological order of the used of the materials during an airborne operation:

- the airplanes
- the parachutes
- the cases
- the equipment of the parachutist for the jump
- the parachuting of materials of any arms
- the equipment of the parachutist for combat
- the air delivery company
- the special parachutings
- the equipment of the jettisoning areas and land grounds
- the recovery of the materials
- the maintenance
- the Air transportation
- Preparation of the parachutes for their sea-transportation.

This paragraph is only a simplified synthesis of technical cards and notes diffused under the seal of the 3rd Bureau of the E.M.I.F.T., which might be referred to with profit.


PARACHUTES à MATERIEL Material Parachutes
(VOILES LEGERES en Tonnes) Light canvas in tons
1
Français French
Américains American
(1) - Existants au 1er Juillet 1953 Existing on July 1st 1953
(2) - Arrivées de métropole et U.S.A. Shipped from FRANCE and from the US
7.000
6.000
5.000
4.000
3.000
2.000
1.000
900
800
700
600
0
(1)
(2)
Juill. July
Août August
Sept.
Oct.
Nov.
Déc.
Janvier
February
Mars
Avril
Mai
Juin June
1953
1954

I. C 47 TRANSPORTATION AIRPLANE

The C 47 transportation airplane finally replaced the Toucan (Junkers 5 2) completely. Three C 47 groups took care of the transportation to Indochina during the last operations.

Jettisonings of Materials

This replacement of the Toucans by more rapid airplanes made it necessary during 1953 to renew all the French types of parachutes for light materials in use. These parachutes, which are inexpensive and open at 140 km/hr, proved to be too fragile to be launched from the C 47 at 190 km/hr. The French industry, unprepared to produce at short notice, was unable to make within the delay required the new series to supply the 1945 compaign, and the U.S. had to provide under the M.D.A.P. about 80 % of the material parachutes used until the suspense of hostilities.

Jettisonings performed from the C 47's raise a difficulty which increased from the day when the enemy antiaircraft defense became active.

- The twenty 100 kg-packages, which as a rule formed the charge of an aircraft, had to be jettisoned at the rate of two for each passage above the ZL (sometimes three), which made it necessary to perform about 10 passages under the same navigation conditions. The last flight involved risks because of the enemy reactions.

The preparation and use of ball races to remedy this drawback by permitting the jettisoning in one or two passages met with several difficulties:

- placing of ball races

Since the hold floors were not standardized, it was practically impossible to fasten the races by means of the bolt provided for this purpose. Tows had to be used, each time the ball races had to be utilized; hence a loss of time and a crowding of the hold.

- arrangement of the packages in the hold

Only one central row of rollers did not permit the stowing of twenty 100 kg-packages during the flight preceding jettisoning. Two rows of rollers would have been satisfactory, but then two turning elements at a level with the jettisoning door would not have been available.

- tentative use of a double turning element

A double turning element was tried but was unsatisfactory; it was impossible for the packages to take the internal turn with low bending radius.

- rolling of the packages on the races

Packages consisting of cases fastened with ropes would not slide on the race. In order to obtain a smooth displacement a board had to be placed under the lowest package in contact with the balls. The preparing operations were complicated by the placing of this board.

CONCLUSION CONCERNING THE JETTISONING OF LIGHT MATERIALS FROM C 47's

If in the futube airplanes of this type had to be used in jettisoning materials, it would be advisable

- to standardize the hold floors in order to permit a rapid arrangement, by means of bolts, of two rows of ball races of the "Bourges" type.

- to arrange, at a level with the jettisoning door, a rectilinear set of ball bearings perpendicular to the two longitudinal rows of races.

Thus the packages could be jettisoned rapidly enough without rotation inside the hold, by two perpendicular translation motions.

Finally among the C.L.A. supplies there should exist usable plywood boards of standardized dimensions, to be arranged under the packages in contact with the rollers.

Jettisonings of personnel

The personnel is parachuted under conditions more comfortable than from the Toucans.

The dimensions of the door make jumps in an upright position possible, which however is not recommended in TAP 660 (canvass first) because of the disarticulation of the parachutist at the time of the shock during opening.

The C 47's were equiped with devices (low lateral cable and SOA extending element) to permit jumps with TAP 664 (1*) (suspending ropes first) (*as well as to permit the jettisoning of materials with parachutes with opening, suspending ropes first).

It would be advisable to confirm by many personnel parachutings with TAP 664 the value of these systems exclusively used since 1942 in the British airborn troops.

II. C 119 TRANSPORTATION AIRPLANE

This aircraft proved to be the best means of air transportation capable of jettisoning just as easily personnel or heavy materials such as 105-guns and bulldozers.

Loaded with six A-22 cases (1 ton each), the C 119 made possible the jettisoning of six tons of supply by airplane in one passage.

The angle at the important level of the hold floor (2) at the time of jettisoning always permitted precise parachutings without an ejector-parachute (A-22 case ejected by gravity). (2*. Under normal flight the angle at the level of the hold of the C 119 is important already, whereas the floor of the Nord 2501 under the same navigation conditions is horizontal).

The only drawback observed was an excessive grouping of the six cases at the exit, which sometimes is an obstacle to the unfolding of the canvasses.

This was corrected by the use of a system where a case released the previous one (every other one). The system consists of straps remaining with the airplane.

III. NORD 2501 TRANSPORTATION AIRPLANE

The cargo aircraft Nord 2501 appeared in Indochina at the suspension of hostilities.

Two groups each one with 20 aircrafts were supposed to operate late in 1954.

One group was based in South Vietnam; the other group was countermanded because of the circumstances.

Jettisoning of material

This aircraft whose structure resembles that of the C 119 permits, as this one, heavy jettisoning through the rear axial cargo-door (castings removed). From this viewpoint it is much more advantageous than the C 47.

Hence its parachuting perfor[illegible]ces do not equal those of the C 119 which possesses larger dimensions.

The Nord 2501 is supposed to permit, after certain adjustments (see further below) the mass jettisoning of the A 22 cases ejected by gravity; it seems, however, to be limited to the parachuting of heavy vehicles, of the ¼ ton jeep, or perhaps, after very careful preparation, to that of the 105 H.M. 2 gun.

This last type of jettisoning, which requires the use of an auxiliary parachute whose purpose is to eject the package out of the hold, was not carried out in Indochina because of the shortage of some devices in the lots on board the Nord 2501 airplanes.

The parachuting of A-22 gains from this type of aircraft were not satisfactory from the point of view of the jettisoning accuracy. This lack of precision is due to the irregular ejection of the packages. This on its turn is due to the insufficient declivity of the hold floor during jettisoning, so that each case has to be pushed by hand.

According to its design, this floor has less declivity than the floor of the C119; furthermore the pilots of the Nord 2501 are reluctant to increase the declivity (1% Although this reluctance is due to the fact that/the jettisoned materials may catch in the rear fixed plane, it is not justified in the case of the gravity ejection. As for the ejection caused by an ejector, auxiliary parachute which could involve a risk, they require no floor declivity).

The problem remains to be solved:

- either by obtaining from the Air Force an angle at the upper level in the gravity ejection

- or by modifying the ball system inside the hold (mechanical drive of the packages, etc...).

In practice it might be useful to have a central cable with rings, reserved for the material jettisoning. This cable might be more resistant than the present cables which would be exclusively reserved for personnel jettisonings.

In accordance with the Air Force one should still define more precisely the composition of the airborne lots on board, the frequency of their verification as well as certain special points such as the mark with a branding iron of the floor plugs to be removed to fasten the ball races, etc...

Personnel jettisoning

The Nord 2501 airplane must permit the transportation and the jettisoning of 40 parachutists.

Only two jettisoners and 28 parachutists can occupy the present seats.

It would be advisable to forecasee a central seat for 12 parachutists, a sort of multiple hammock fastened to the cables and able to glide on these cables in order to disappear when the order "stand up, fasten" is given.

The personnel jettisoning caused some incident in which the parachutists were caught in the stiles of the doors from which they were jumping.

As long as these stiles are not modified, protective iron armatures are placed before the jettisoning operations.

IV. PERSONNEL PARACHUTES

The French TAP 660 parachute with automatic opening "canvass first" replaced the U.S. T 5 or T 7 parachute. It possesses more stability than the American parachute in downward motion, especially during landing.

Like all the parachutes with opening "canvass first" it involves the fatal risk for the parachutist to become caught in the canvass in case of a wrong exit.

The TAP 664 version "rigging lines first" of the previous parachute was used on the aircrafts with high jettisoning velocity: C 119 and Nord 2501. This parachute proved tobe excellent owing to its smooth opening and safe operation. It caused no casualty. The rate of secondary incident in the case of this material is very low:

- 8 double canopies
- 3 multiple canopies

out of 11.400 jumps between June 1st and December 1st, 1954.

The use of the TAP 664 with low cable, from the C 47's, developed since late in 1953, met with the users' reluctance.

The French TAP 690 with controlled opening, with its "lampion extractor" is satisfactory. This extractor can be replaced without difficulty by the U.S extractor of the same type existing in Indochina.

Parachute with controlled opening for jettisoners: See the Paragraph C.L.A. Equipment.

All the above listed parachutes have a seating bar, which, in a tropical

country, becomes very rapidly moldy. The molds by contacts extend to the nylon of the canvass. The mycelium increases within the fabric itself, which becomes deteriorated, which would not have been the case had it not been in contact with active molds.

The bag should be made of nylon as all the other parts of the personnel parachutes.

V. PARACHUTES FOR LIGHT MATERIALS

The lessons concerning these parachutes were drawn from the technical notes No 350/MAT/ST/AERO/SC of October 18, 1954 (B.H. No 1811/ EMIFT/S/SC of November 9, 1954).

Summing up, the following is desirable:

- a unic type of material parachute (solid, useful charge 100 kg)
- a unic type of bag (rigging lines first)
- the obligation to arrange the scrapped personnel parachutes in the above mentioned bags so that users will use only one model of material folded and ready.

VI. PARACHUTES FOR HEAVY MATERIALS

(See the above mentioned technical note).

The last operations pointed out the advantage of parachuting with one-ton charges. These parachuting were performed with the help of the U.S. supplies of A22 cases and of G 12 parachutes (useful charge 1.000 kg).

These last parachutes were not quite satisfactory because of their irregular opening (5 - 25 seconds) and of the high deterioration of the canvasses during rapid openings.

The multiple folding contrivances of the G 12 leave only a small margin between the rapid opening with canvass bursting and the long torch-opening on the ground.

A folding method, however, was developped and explained to the users so as to permit a better use of many G 12's left in Indochina (opening time between 8 and 12 seconds).

The G11 parachutes with useful charge 1.500 kg for the jettisoning of vehicles, guns and platforms, were rather little used (parachuting of 105 HM 2 guns on Dien Bien Phu, bulldozers). These parachutings performed according to the U.S. technical notes from C 119 cargo airplanes were quite satisfactory.

VII. EQUIPMENT OF THE PARACHUTIST FOR COMBAT JUMP

This equipment was satisfactory as a whole for the jump as such. Some reservations must be made as to its value during combat under the heat and dampness conditions of the Far East (See: Equipment of the parachutist for the combat).

During the opening shock one must note:

- losses of helmets still frequent due to insufficient resistance of the French chin-chain, or to a poor design of the fastening system. This problem has still to be resolved (compare with the English parachutist helmet (1*) which differs from the Infantry helmet and might be a disadvantage during combat((1*. The German TAP were also equipped with a special helmet. This seems to have enhanced the prestige of the arm. As for the present U.S. helmets, they were reserved at first, as is well known, for the American TAP's).

The problem of the leg bag is being resolved locally as follows:

- replacement of the leg bag by large size back bag placed under the ventral in reversed position.

- replacement of the hemp line and of the hand locks by a nylon strap from scrapped SOA's.

VIII. LIGHT CASES

As a rule, the light cases were not used in large number because they are not very efficient. They are suitable for charges of about 100 kg and are expensive and useless.

The following pieces of equipment were used in large number:

- the lashing rope of hemp, 12 - 15 mm in diameter and having a 600 kg resistance. The daily consumption of nonrecovered rope reached as much as 2 metric tons per day at the rate of 3 kg approximately for each 100 kg-package. This rope was used to assemble the elementary paddings (boxes) and to fasten the padings to the straps of the parachute.

The following remarks must be made concerning the series of US A 3 to A 10 cases, and the corresponding French TAP cases:

- 3: US metallic container not much used.

TAP 3: French 20l containers arranged two by two in a box. These cases did not exist empty in the GLA's which received them 10 l full from the general depot and/or from the Quartermaster Corps. It is an inexpensive construction material which was very useful. A certain number should exist in the TAP's for special liquid supplies (water).

- 4: Small cardboard cases, do not exist in TAP's.

TAP 4: Were received in small number at the suspension of hostilities; seem to be interesting for special jettisoning operations. These compressed cardboard cases, that can be stored easily in a flat position, should be combined with strap harnesses of the A 7 type.

A5: These cases exist in rather large number (20.000); were used each time when a material could not be jettisoned otherwise (155-shells); are reserved in principle for the jettisoning of the heavy armament of the parachutist.

A6: Textile case with damping cushin, can contain plastic three 25 l bottles. About one thousand of these materials exist in Indochina. These case were used in parachuting fragile products (medical, pharmaceutical products) and liquids before using the TAP 3 containers.

It is rather expensive.

TAP 6: French case similar to the A 6, not received in Indochina.

A 7: Strap harness in very small number in Indochina.

TAP 7: French lashing straps withrapid-unfastening buckles, not received in Indochina.

A 8: Rigid metallic cases to ve fastened to a bomb dropping gear.

TAP 8: are not used

A 9: Strap harness for the parachuting of shell trefoils (? three-cahmber shells ? "trefles d'obus"). Those existing (about 500) do not correspond to the needs. Was advantageously replaced by the clip mentioned previously of local fabrication.

A 10, TAP 10: Racks in rather small number (700) and used for the jettisoning of materials less than 100 kg in weight, not very fragile and irregular in shape (rather rarely used).

A 300 kg case was designed in small number and used for C-47's under a cluster of 3 parachutes with a unitary 100 kg load.

This case, 0.60 m wide, 1.10 m long and of variable height was patterned after case A 22.

In combination with a suitable ball race (see previous paragraph concerning the C-47 aircraft) it permitted more concentrated, more rapid and more precise jettisoning.

IX. HEAVY CASES

The A 22 US case (useful load 1 T) was used exclusively and was very satisfactory. Over 3000 specimens exist now in Indochina (See heavy parachutings).

The supply platform with a 3 T useful load requested from the U.S. was not delivered.

The French materials corresponding to these two cases were not received in Indochina.

Seven hundred metal fitting sets for the parachuting of the perforated airfield plates assembled in 30 (1T) under parachute G 12 were fabricated locally.

X. THE PARACHUTIST'S EQUIPMENT FOR THE COMBAT

Because of the extensive use of the Airborne troops, the Indochina campaign made it possible to experiment and apply/new equipment materials.

In this case, different users involve different estimations.

The following conclusions can be drawn:

French camouflage dress:

Is satisfactory in combat, offers a good blending of colors. The cloth dress is somewhat rough and should be softened. The color in question should be used on a standard basis, because the parachutists are detected when operating along with non-parachutist infantrymen.

French jump boots:

No doubt very good on the European theater of operations. Do not resist the dampness which oxidizes the screws or fastening fittings, and separates the soles from the shoes. Those equipped with copper screws last much longer.

Bush shoes

These shoes no doubt are light and comfortable. They can be used in airborne operations, if they are strengthened at a level with the ankle. Some small holes should be made also near the sole, to evacuate water.

Individual French knapsacks

This material is much dabated according to its size, concerning which there is no agreement.

On the other hand, everybody agrees that in the special case of rapid operation, the TAP havresack, which although small holds much and can be essily adjusted for the jumping operation, is satisfactory.

Bedding material

Because of the very cold nights in Tonkin, blankets have to be used. These blankets are very cumbersome.

A warm and uncumbersome sleeping bag, opened at both ends and with a hood and t2o sleeves, should be used.

Another simpler solution is the soft thick flannel overall slipped under the combat dress at nightfall.

TOOLS

Individual Tool

The U.S. shovel-pickax was quite satisfactory. Two French prototypes of a multiple-use tool (shovel, pickax, hatchet, nippers) were used. Some think it is a practical and efficient tool, others that it is too compliçate and fragile.

"Coupe-coupe"

This tool necessary in the bush and in the forest is satisfactory because of its versatility. Too often it is used for diggings and thus loses its own qualities.

Dagger

The US dagger is satisfactory.

Coupe-coupe dagger of Colonel Romain Defosses; 10 specimens were made and put at the disposal of the TAPI8s; no information has been received so far concerning the advantage of this piece of equipment.

Dagger bayonet (for US M1 carbine). An interesting idea. The two prototypes received in Indochina required some changes, but modified models were never received.

SPECIAL EQUIPMENT

Camouflage Net for Individual Hole

Nothing can be said about the efficiency of this piece of equipment since no enemy air force was used in the campaign.

Colored neckerchiefs for regrouping operations

These neckerchiefs made of the fabric of scrapped GI parachutes were useful and efficient for regrouping operations on the ground.

Equipment for Jumps into Water

Utilized by the GH I's, the American Mae West, makes it possible to swim with wet parachute.

Adjustment of the equipment to tropical Conditions

As a rule any cotton equipment becomes deteriorated by molds in Indo china. Metallic fittings on fabric or on leather become oxidized and lose their qualities.

Certain jumping dresses were subjected to an anticryptogamic treatment. This seems to be a satisfactory solution.

Armament

The armament used is well known. The information to be drawn here regards only its use during the combat jumping by the airborne elements.

Mentioned is a reminder:

M.s 49 PM - 36-CR-39 rifle - on the man

Lewis gun in leg case

Mortar, machine-gun, bazooka, etc... in A 5 gain

Arm model 52, type FM; a case was fabricated and given for experimentation to the TAPI's after the STAI tests.

75 SR possess a case-small cart used as jettisoning container.

This cart, which arrived in the Far East toward September 1954, was not used. Jettisoning the 75 SR was performed at Pau, France, with a A5-case. The breech being carefully protected, the test was quite satisfactory. In the Far East a wooden container was made and used with satisfactory for jettisoning operations at D.Z.P.

ACCESSORY VEHICLES

- Chest carriage for 75 SR gun, jettisonable.

No doubt very practical on the European theater of operations, was not quite satisfactory in Indochina because of the soft and difficult ground.

Bernadet Scooter

This material which is satisfactory as a tractor on roads or on easy grounds, is noisy and does not perform suitably during parachuting. It is very heavy and is difficult to control on whatever ground used.

Stretcher bicycle

A complicated material of time-consuming adjustment; does not correspond in most cases to the needs in Indochina.

Stretcher wheelbarrow (fabricated in Indochina)

Only a prototype was made; no information was given by the experimenting army element.

Folding strechter in cloth

Can be used in Indochina.

Three-wheel river waggon

Was useful on dry small dams in good state for the transportation of 100-kg boxes.

XI. REMARKS ON THE PARACHUTING OF ALL-ARM MATERIALS

Three factors must be taken into consideration in parachuting any materid

- Relative aerodynamic drag
- Dimensions
- Weight

a. Relative aerodynamic drag

- The mean density of the package considered must not be less than 0,3

- The three main dimensions of the package must be of the same order of magnitude, (from the simple to the triple). If one dimension is very different from the other two it must be the longest one (hence the package must be of the bar type and not of the sheet type).

If the preceding two conditions do not obtain, the aerodynamic drag of the package relative to its weight during jettisoning risks to be excessive, and the package may become caught on the tail plane of the aircraft.

Hence the density must be reduced to an acceptable value eventually by ballasting.

Materials of the sheet type must be piled up in order to make a uniform package (case of the perforated airfield plates).

b. Dimensions

The maximum dimensions of the jettisoned packages are determined by the dimensions of the jettisoning openings:

C 47	- height of the jettisoning door	1 m 70
	- width of the jettisoning door	0 m 75
	- width of the hold on a level with the door	1 m 80

Thus the largest package will have the following dimensions:

- width 0 m 60
- length 1 m 50
- height 1 m

(The 3rd dimension is determined by the fact that the package must have a maximum density of 0,3, and a maximum weight of 300 kg in order to be handled easily in the hold of the C 47).

Nord 2501 height under the cap ("casquette") of the axial cargo door 1 m70

minimum width of the hold (on the floor) 2 m 20

Thus the largest package will have the following dimensions:

- height 1 m 65 (parachute inclusively)
- width 1 m 80
- length determined only by the minimum density (0.3) and the weight of the package.

C 119 - Height of the axial cargo door: 2 m 40

- width of the hold 2 m 80

Thus the largest package will have the following dimensions:

- height 2 m 35 (parachute inclusively)
- width 2 m 40
- length determined only by the density and the weight of the package.

c. Weight

One must consider the weight of the entire or divided prepared material if the tactical considerations make this possible and if so required by the type of aircraft available.

- Materials whose weight is lower than 300 kg

These materials can be jettisoned indifferently from C 47's, Nord 2501 or C 119.

- Materials of simple geometrical shape (boxes, cans, casks, etc..) and whose weights range between 300 kg and 1 ton:

- in A 22 case
- from Nord 2501 or C 119

Materials of simple geometrical shape and of weight ranging between 1 ton and 3 tons

- on a C platform, French or US type
- From Nord 2501 or from C 119
- Materials of irregular shape (machines, guns, vehicles, etc...) and of weight ranging between 1 ton and 3 tons:
- on boards special for each material
- from Nord 2501 or C 119

Materials of irregular shape and of weight between 3 and 6 tons

- on boards special for each material
- from C 119

XII. AIR DELIVERY COMPANIES

The lessons to be drawn from the air delivery operations were the object of technical Note No 360/ST/Aero of December 9, 1954.

A secondary point is not quite satisfactory with regard to the equipment of the jettisoners; these, in the case of emergency, possess

- an automatic parachute harness with the useless and slack raisers. Since this harness is not maintained by the dorsalbag, it slips from the shoulders
- a ventral parachute which must be fastened to the previous harness if the aircraft is left
- a survival kit, fabricated in Indochina and fastened to the above ventral parachute

- a complete automatic dorsal parachute (with harness) to be put on if permitted by the time left to get out of the aircraft.

Despite this accumulation of life-saving means the jettisoner does not feel quite secure and, when possible, puts on only one dorsal parachute TAP 690 with controlled opening.

It would be more advisable to equip the flight teams of the C.L.A.'s with adjustable and light controlled dorsal parachutes (1* similar to those of the U.S. jettisoning teams), to whose harnesses the survival kits could be fastened.

The prototype materials fabricated by the French industry for the C.L.A's has not been experimented in the Far East.

XIII. PARACHUTING OPERATIONS WITH DELAYED OPENINGS

The parachuting of materials from a high altitude (3,500 m) was a necessary result of the reaction of the enemy anti-aircraft defense above the entrenched camp of Dien-Bien-Phu.

A double difficulty was met during its execution:

- Developing a simple, precise and constant retarding device
- Type of operation of the retardation device in connection with the opening of the parachute.

The development of the retarding device was a matter of successful improvised and standardized fabrication. Its operation was precise and satisfactory.

On the other hand the type of action of the retarding device was not quite good

- either because the torch parachute would not deploy (20%) when the retarding device would operate

- or because the parachute would burst when the retarding device would operate, the package dropping in free fall at high speed with the parachute folded in its bag.

At the present time electronic devices are being tested in France By the D.E.F.A. in order to secure an absolute precision of operation of the retarding device automatically shrouded according to the position of the package in space.

The development of this device will considerably facilitate the parachuting operations with retarded opening without resolving, however, the problem of the deploying of the canvasses whose solution must be the object of a separate investigation.

Jettisoning without visibility (1) will become possible, it seems, as a result of thests of the above electronic devices.

(1* A large number of jettisonings had to be delayed because of the lack of visibility above D.B.P.; lack of precision in the operation of the captive balloon raising above the cloud mass).

XIV. EQUIPMENT OF THE JETTISONING AREAS AND OF THE LANDING GROUNDS

Regrouping on the ground Nothing new was experimented in Indochina. Tere seems to be room for improvement in the modern methods such as electronic beacons with ultrashort wave signals (being tested in France).

infrared beacons for night regroupings (experimented in France in 1952 already). Day regrouping at a small distance by means of colored neckerchiefs is satisfactory.

Identification of the packages at night Several methods were used

- phosphorescent paints, bands and strings: inefficient beyond 10 - 15 m.

- US electric lamps with blue or red light: efficient but necessary in very large number for light 100 kg packages

One could experiment the process of painting on the faces of the cases pearled squares (1* Pearled screens reflect the light in the direction of the incident light, car catadiopters, highway advertising at night, movie screen, etc).

The identification of the packages at night would be performed with the help of infrared projectors combined with the corresponding optical devices.

Night beacons of the Z. L's

The electric lamps or lights arranged at the bottom of vertical cylinders (boxes, drums, etc...) were satisfactory as a rule.

More discrete methods could be experimented, however:

- Infrared lights observed by the airplanes

- Pearled beacon pannels, illuminated by a IR light on the airplane and observed by airplane.

Radiophonic ground-air connection

The Z. L. airplane connection obtained by the extremely light ground station V.H.F. A.N.T.R.C. - 7 US proved to be excellent. Beacon teams thus can speak directly with the Air Force teams at the frequency of the latter.

Jettisoning of Perforated Airfield Plates

The P.S.P. plates to cover the taking off lanes were jettisoned by 30's with accessories, in the state in which they are assembled and delivered by the manufacturers. Each package weighing one ton is equiped with a set of fittings on the board and fastened on a C-12 parachute.

A C.119 airplane can jettison six packages of P.S.P. plates at the same time.

With two packages it is possible to arrange five rows of grates on a 40 m width, hence 2 m in length of a taking-off lane.

XV. RECOVERY OF THE AIRBORNE MATERIALS DURING OPERATION

The airborne materials, personnel parachutes, material parachutes, cases, plates and other jettisoning accessories are

- very expensive
- fragile
- few on the theater of operations (le especially as regards the heavy jettisoning accessories).

Hence their recovery and repair is a must

- to prevent their rapid deterioration
- to possess again an important potential.

The Technical Inspection of the Material of the F.T.E.O's carried out a certain number of missions whose purpose was to determine the conditions under which the recovery of the airborne materials was performed, during certain jettisoning operations of airborne troops and of the air deliveries.

From the report of these missions and of the tests conducted in the laboratory of the S.T.A.I, it follows that, already on the 5th day, modls attack the cotton parts of the parachutes, and oxidize dangerously the metal parts when after humidification rapid folding and storing in the bush in a damp and hot atmosphere are performed.

Another observation emphasizes the great amount of losses of parachutes due to sabotage on the ground (cut rigging lines, pannels taken from canvasses, etc...) carried out by combatants who do not appreciate the value of these materials and the difficulties involved in their replacement.

Furthermore, in the case of heavy jettisoning, there are jettisoning lots for a given material, 105-gun, jeep, dodge, etc., which form a whole. In order to renew the jettisoning of these materials, it is just as necessary to recover the slings, strainers, lashing straps, dampers, control parachutes, and traction attachments, sets of metal fittings for the jettisoning of perforated airfield plates, as well as the carrying parachutes and the jettisoning plates.

Consequently the principle consisting in forming recovery teams made of specialized parachutists who are dropped with the airborne troops, or after the air delivery operation, is a solution which permits, with the means provided by the headquarters

- to control rapidly the recovery and centralization of the materials near the jettisoning area

- to carry out a sorting according to the use and the state of the materials

- to organize its shipment toward the Material Units involved (repair, folding, storage)

XVI. MAINTENANCE -DRYING - FOLDING - STORAGE OF THE PARACHUTES

The course followed by a parachute (personnel or material), brought undeteriorated from an operation, passes at the corresponding Maintenance and Folding Section, in order to be restored to usable conditions.

Theere is nothing special to mention concerning this course which was satisfactory. However, since in Indochina the climate requires particular precautions, the drying of the parachutes, wetted, washed or simply impregnated of humidity by the air, raised a problem of rate. Installations were established and two mobile drying stations were tested.

To obtain a good drying operation, the position of the parachutes should be inversed by placing the center section with the leading edge upward and the vest downward, thus the water evacuting from the leading edge toward the vent hem, and from the upper part of the rigging lines toward the connection dowels. Some accidents were caused by too great adhesion due to too much humidification of the leading edge, the rest of the parachute being correctly dry.

Folding was satisfactory. The welltrained personnel is able to raise the rate at the peak moment. This rate, however, must not be accelerated except in case of absolute necessity.

The storing of parachutes was satisfactory and the installation of shelves made possible the complete utilization of parachutes which had remained folded for one month, in the SEPP's as well as in the SEPM's.

XVII. AIR TRANSPORT OF HEAVY MATERIALS

The typical leadings foreseen by the B.E.T.A.P. in France resolved the problem of air transportation on board

- C 47's
- Nord 2501's
- C 119's

of the nondisassembled materials and vehicles.

A new problem arose in Indochina when transportation by air, over a difficult ground, materials whose unitary weight exceeded the useful load of an airplane (bulldozers, M-24 tanks, Half-tracks, AM M8 and M20, M5 tanks, M8 howitzer).

Under these conditions, the materials (1* M 24 tank at the Plaine des Jarres and at Dien Bien Phy) were disassembled and distributed into the Bristol and C 47 airplanes, then assembled later on by specialized teams.

These operations were quite satisfactory.

XVIII. PREPARATION OF PARACHUTES FOR SEA TRANSPORTATION

The packing and parachutes to be shipped to Indochina were satisfactory
.. Polyvinyl covers assembled in boxes.

Since the hygrometry at the packing place was low and the materials were dry, the release of water vapor in the cover when the temperature increases is little. The polyvinyl membrane is sufficiently impervious to the external water vapor. From these two facts it follows that the presence of silicagel inside the covers is useless.

No packing seems to be satisfactory when shipments are made from Indochina to France especially in winter.

Cool chamber tests showed that a lowering of the room temperature was reflected by a noticeable condensation of the water vapor contained in the impervious packing. This condensation affects especially the leading edge and the rigging lines of the parachutes.

Introducing silicagel has no effect; the small bags arranged in the covers do not become heavier because of the low water vapor contents of the cold atmosphere of the packings.

On their arrival in France the parachutes must be extracted immediately from the packings and dubjected to drying.

COMPREHENSIVE CONCLUSIONS

The sensible use of the airborne materials during the operations in Indochina met with three types of difficulties:

1. The constant variation of the strategical and tactical conception of the combat, due to the changes in the enemy armed forces, did not permit the defining and establishing of a stable method with its consequent technical instruction of the personnels.

As a rule miscalculations (mentioning in this report only the losse of a material that was expensive, very specialized and difficult to repaced by our own means) were met each time the TAP's were considered as usable by the Headquarters.

2. Routinism, the apprehension of the new techniques, were reflected in the users in a subconscient resistance to the new materials (1) which possible was the case of unknown accidents (1* difficulty in inducing the troops to appreciate the French parachute TAP 660, the TAP 664, the jumps from Nord 2501, etc...). These feelings bordering sometimes on superstition are quite spread among parachutists and to a certain extent are excusable.

Experience showed that it was very difficult to introduce into practical utilization a new technique and a new material in the very course of operations (training impossible without interrupting the execution) (2* it would have been necessary to double the personnel. As is well known, the air delivery operations became more and more important month after month and were never interrupted).

3. Finally the diversity of the airborne materials, of different nationalities, only increased the difficulties involved by training and by their use.

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